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Stanton Type 8K/1 Spun Concrete Lighting Columns fitted with G.E.C. Z.8484 Fluorescent Lanterns at Bedford.

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ELECTRICAL REVIEW

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Convenience with Economy

ONE noteworthy feature of the 1958–59 report of the Electricity Council was the evidence that the rate of growth of the supply of electricity for domestic use had greatly outstripped the increase in industrial demand. One school of economists may deplore this as indicating a slackening in production accompanied by a rise in consumption, but actually it reflects the higher standard of living and also a better use of our fuel resources.

As has been pointed out many times already, the rate of domestic electrical advance owes a great deal to the lifting of hire-purchase restrictions and the reduction of purchase tax on appliances. The sales of equipment by Electricity Boards rose considerably in 1958–59—from £29·0 million in the preceding year to £38·5 million. These sales were only part of the total, for private firms still enjoy a substantial share of the business. The figures prove that electrical methods are rapidly becoming more popular with all consumers; we are getting further and further away from the old idea that electricity was expensive and therefore only usable in any considerable degree by the more or less well-off.

This is the main theme of the article by Mr. J. I. Bernard in this issue. In this it is shown that, quite apart from the intrinsic merits of electricity, its price has remained almost stable during the past few years while its rivals have become much dearer. Improvements in design (a subject dealt with in this issue by Mr. T. Davidson) have also helped to make the use of electricity more economical, and by the correct use of electrical appliances even greater savings can be achieved.

Because of the power plant shortage the supply authorities were not anxious to encourage electric heating in the immediate post-war years. Now that this shortage has been overcome, electric heating is regarded with more favour and the relative cheapness of electricity, coupled with its adaptability, cleanliness and ease of control, makes it really competitive, even with coal. Of course the supply authorities still prefer the heating load to come on in off-peak hours and this has given a boost to floor warming, particularly in blocks of flats. The economics of this use of electricity is dealt with in another article by Mr. J. W. Moule who has had extensive experience in the South of Scotland. We think that even electrical men

will learn something from these articles and from the survey of appliances which forms the subject of the special supplement in this issue. Above all we hope that the matter presented will provide readers with convincing arguments for use when they are tackled by their non-electrical friends and acquaintances on the subject of electricity in the home.

PROFESSIONAL ENGINEERING TRAINING

The vital importance of an efficient and effective system of educating and training our engineers was emphasised by Sir Willis Jackson in his presidential address to the Institution of Electrical Engineers which is reported in this issue. We agree wholeheartedly with the President when he says that one of the greatest shortcomings of our educational system is the continuing tendency to regard the schools, the universities, the technical colleges and industry as separate compartments, and not as interwoven and interdependent elements in a continuous educational process. The I.E.E. has done a great deal in attempting to rectify this situation. These efforts will be continued, but many other organisations must pull their weight to ensure the much greater measure of collaboration which is required.

Although Sir Willis confined his remarks almost exclusively to the education and training of professional engineers he also referred to the much larger body of technicians and craftsmen. It is too frequently overlooked that without their skill and resource no new idea could be successfully translated from the laboratory and design office into efficient, reliable and economic engineering equipment. The satisfactory education and training of these men is no less vital and in some respect it raises more difficult problems.

UNDER-RATED

The general public very rarely has a chance of appreciating the progress of scientific knowledge and apparatus. When such opportunities do occur, the tendency is to over-publicise. This creates the impression that the particular apparatus is omnipotent, with the result that the public have become somewhat sceptical. This situation, we feel, was not greatly helped by the widespread use, last week, of computers in assessing election results.

Most of the computers used by the television, radio and Press services were " programmed " on the basis of the 1955 election results, with added refinements, depending on the number of candidates standing at particular constituencies, whether the former member was standing, etc. Reference was also made to an empirical, statistical law which states that the number of seats obtained by any party is dependent upon the cube of the number of votes cast for it. The capabilities of computers are far in advance of the task of predicting the final outcome from a very small number of early results, while the calculation of percentage swings can easily be done with a slide rule.

The election has, however, brought computers before the public eye to a greater extent than any advertising campaign. One of the greatest advantages of computers is the infinitesimal time needed to carry out simple calculations. Even this advantage was somewhat overshadowed by the statisticians who based their predictions on wider knowledge than that fed into the computers. Although the use of computers was really a commercial transaction between the radio and television authorities and the operators of computer services, the general public has been left in no doubt that there are practical applications for computers, although this is not a particularly useful example.

OPPORTUNITIES FOR THE LESS QUALIFIED

Although the advantages to both the individual and the country to be derived from further education and the obtaining of qualifications are undisputed, the fact remains that the skill of a large proportion of the community is of a physical rather than mental nature. That opportunities do exist for people who do not possess educational certificates and other qualifications to make a positive contribution to science and technology is not always recognised. Such technician grades as laboratory assistants, often employed in the maintenance of instruments and the preparation of experimental apparatus, are clearly closely associated with scientific learning and new development, while craft apprentices, who may eventually assume foremen's responsibilities, may well be the investigators of some new technique or product.

Certainly this aspect of a career for the unqualified should be made well known, as it may serve to stimulate a desire in the individual to take advantage of the day and evening facilities offered by most companies and organisations for both basic and advanced education or training. Experience has shown that a worthwhile proportion of the unqualified entrants to these two careers alone eventually graduate.

BLOCK STORAGE HEATERS

Reference is made in the leading article to off-peak heating. This raises the long-standing argument about block storage heaters which are allowed to be supplied free of purchase tax on condition that they are used only in industrial or commercial premises. These heaters would provide a very good means of levelling the load curve if they could be used extensively in the home and most of the Electricity Boards would be willing to supply electricity for them at special off-peak rates.

Their peculiar attributes would seem to entitle storage heaters to special consideration. The argument used against this is that they are merely one form of electric heaters and could therefore not be relieved of the tax unless all other domestic heaters were similarly treated. If this is a sound contention (which we do not believe) it strengthens the case for the removal of purchase tax from all domestic heating appliances.

KETTLES AND PERCOLATORS

Next week's issue of the *Electrical Review* will contain an illustrated survey of electric kettles and coffee percolators. Information given in tabular form will include details of capacity, loading, special features and price

All-electric houses on the Orchard Estate, Woking; note absence of chimneys

Electricity at Home

ITS ECONOMY PROVED IN PRACTICE

This article is directed particularly towards electrical men and their wives who, the author suggests, should be aware of the economic advantages arising from the use of electricity in the home and should set an example to their non-electrical friends

By J. I. BERNARD, M.I.E.E.*

To readers of the *Electrical Review* who have proved for themselves that electricity is not only the best for cooking, heating and other domestic purposes but also the cheapest, this article may seem to be no more than a reminder that Queen Anne is dead. For others who are not yet enjoying these advantages it will discuss some of the commoner objections and, I hope, show how ill-founded they are today. The Editor, when he kindly invited me to contribute this article, suggested that it might be of interest also to the wives of readers.

"Get Up-to-date—Go Electric" the advertisements say and for those of us in the electrical industry the slogan should surely be "Go All-Electric." What does this mean in practice? Of course electricity will be used for lighting, radio, television and labour-saving appliances like vacuum cleaners and washing machines, but when we come to the main heat services of the home, heating, cooking and water heating, some doubt may arise about the use of electricity instead of the traditional fuels such as coal or coke, oil or gas. In fact it is particularly in regard to heating that one hears doubts expressed by electrical men. Probably the size of the electrical industry and the ever-growing trend towards specialisation react against a general appreciation of the economics of electric heating. Anyone concerned with the manufacture of radio receivers or large switchgear, unless he has taken the trouble to find out, may know less about electric heating than a layman who has some interest in the subject.

Again, many electrical engineers who have to deal with industrial power applications often seem to be mesmerised by the idea, which dates from the beginning of the century, that the use of electricity for heating purposes is bound to be uneconomic because of the inherently low thermal efficiency of the steam cycle. This belief survives despite the fact that the 2 or 3 per cent efficiency of the early power stations had been raised to 20 per cent at the end of the last war and now reaches an average of over 25 per cent with the latest stations maintaining year-round figures better than 30 per cent and still further improvement in sight—to say nothing of nuclear fission as a boundless source of energy. Domestic boilers may have higher efficiencies at full load, but not necessarily on the average over the year, and as the price of fuel delivered to the home is much higher than at the power station the economic case for electric heating is stronger today than ever before.

Moreover, from a more personal point of view it is important that we electrical folk should set the pace for the rest of the community; one's friends may discount to some extent the example of an all-electric home if it belongs to an electrical engineer but there is no doubt that they will remain completely sceptical about the value of electric heating if an electrical engineer is known to favour oil or his wife uses gas for cooking.

Cooking

The electric cooker has always been regarded as the key to the all-electric home, and to raise the matter in almost any electrical gathering is to discover that the proportion of those present who have electric cookers is

* Director and Secretary of the British Electrical Development Association

often no higher than among the public at large. The reasons are difficult to find, but one or two factors have been noted: ladies may be up to the minute as far as fashions in clothes are concerned but they are apt to be intensely conservative when it comes to methods of cooking. Moreover, this increases with the years—a recent survey showed that of housewives up to 25 years of age 80 per cent had electric cookers, but in the 45-and-over age group the proportion fell to less than 20 per cent. In other cases, some unfortunate experience of electric cooking years ago, perhaps forced on a wife during wartime evacuation or by an enthusiastic husband, has left objections in her mind which are difficult to dispel.

Usually the complaints relate to slowness and difficulty of control, but these were largely due to the old-fashioned solid boiling plates which were slow in heating small quantities, even with special pans, and never looked really hot. Anyone who can judge the heat of a flame can also manage the latest highly loaded radiant plate which gets red hot in a matter of seconds and yet can be turned down to the slowest simmer unaffected by draughts and easily repeated by the same setting of the dial of the modern stepless simmering control.

In addition to improvements in the boiling performance, every make of electric cooker now has one or more models with auto-time control, one of the biggest boons to busy women. A meal can be prepared in the morning or the night before, put into the oven just before the housewife leaves home for business or a day's outing and when the dial is set for the appropriate cooking time the automatic control will switch on and off so that a hot meal is ready whenever required in the evening. Moreover, if she is a little late in getting home the meal will be kept hot.

As regards results, the unrehearsed remark of a television prizewinner who had bought an electric cooker and discovered how much better food tasted was typical.

Models of the latest electric cookers can always be seen at local electricity showrooms where skilled demonstrators will be glad to explain all the latest improvements.

The cost of electric cooking is seldom queried nowadays, and recent investigations in South East England and in Ireland have confirmed that the old rule of thumb still holds good, namely, that on the average the consumption of electricity for cooking is one unit per person per day. This means no more than 2s 6d a week for most families and there's nothing cheaper.

Water Heating

One of the most notable improvements in living conditions which has been brought about since the last war is, I think, in connection with domestic hot water supplies. Hot taps no longer belie their name by tepid trickles. Electricity has done much to bring about this improvement and can do more. By far the largest number of installations have taken the form of immersion heaters fixed in existing hot water tanks or cylinders and used primarily as boosters to overcome deficiencies of fuel-fired boilers and as a kind of auxiliary service in the summer, the heater being switched on first thing in the morning and off some time later when it is thought that sufficient water has been heated for the day. It is true that a thermostat is generally incorporated in the immersion heater head, but by this method of use it is little more than a safety device to prevent boiling. Such water heating installations are only a poor imitation of the constant hot water service that electricity is inherently so well able to provide.

The difference between the two is entirely a matter of the efficient lagging of the hot water tank or cylinder and making sure that there is no circulating pipe or other part

All-electric residence of Mr. G. Boyd Anderson at Gogarbank, near Edinburgh. (Architect, R. H. Matthew, C.B.E., Professor of Architecture, University of Edinburgh)

of the system losing heat continuously without water being drawn off. But it should be noted that efficient lagging is more than a flimsy jacket which allows almost as much heat to escape as it retains. The best method of insulating a tank or cylinder is to form a surrounding case or box—in a narrow cupboard this merely means fixing a plywood or hardboard front—so that the space around the tank or cylinder, which should have a minimum thickness of at least two inches, may be filled with fibreglass or other high-grade insulation; a top or lid will complete the job and the loss of heat when no water is drawn off will then be reduced to a negligible amount—no more than the cost of a daily newspaper. Constant hot water always on tap without labour, and without having to worry about whether a switch is on or off, is then provided at minimum cost.

Some people refrain from installing adequate lagging because they want the heat escaping from the storage vessel for airing linen, drying towels or even heating the bathroom, but a little consideration will show that these auxiliary uses are not required day in and day out. In practice, they can be much more economically supplied by a separate electric heater or towel rail switched on only when needed.

With efficient lagging and no circulating pipe losses the consumption of electricity for water heating is almost directly in proportion to the amount of hot water used. A farthing a gallon or 4d for a hot bath—what could be cheaper? Lagging hot water tanks will lay the bogey of "expensive electric hot water."

Heating

Everyone knows the advantages of the electric fire, the electrical equivalent of that other British institution, the open coal fire. The saving of labour by the electric fire and the way it quickly gets hot are well known, but it is not always used in the most economical way. For use in spring or autumn, or in rooms which are occupied only for short periods, an electric fire is ideal, but when it comes to heating a living room for several hours a day throughout the winter, or heating a whole house, the problem is rather different especially for those who haven't any money to throw away. As to the possibility of an economical solution, many electrical men are still quite sceptical. And it must be admitted that it is not easy to devise a cheap electric heating scheme for a rambling old house which loses heat rapidly in all directions (often described by occupiers as a "cold house"), but then this type of dwelling is expensive to heat by any method.

To arrive at the best method of electric heating in any particular house requires a certain amount of experience,

some appreciation of the various methods and allowance for the individual tastes of those who are going to live in it. First of all, the characteristics of different types of heater and their relative suitability must be appreciated. Most of the heat from electric fires, for example, is given off as radiant warmth which is akin to sunshine, or the light from a lamp, and travels in straight lines in certain directions which are governed by the shape of the reflector or other emitting surface. Consequently, the ordinary electric fire will not warm parts in shadow; hence the "warm front and cold back" effect which can be a drawback if the air temperature is too low.

The alternative method of heating is by convection which means hot air from a "radiator" as used with hot water in central heating systems; the electrical equivalent is fitted with an individual immersion heater and filled with oil which does not freeze or evaporate. The heating effect is that commonly known as "central heating." Because air holds very little heat there is bound to be considerable delay before sufficient heat can be transferred from the electric element to the walls of the room. This is one of the reasons why central heating systems are run more or less continuously, but it is liable to lead many people to complain of stuffiness often without feeling comfortably warm. The reason for such an apparent contradiction is that the temperature of the air at head level is always a good deal higher than the temperature of the floor or the feet; moreover, the air temperature generally with hot air warming must always be higher than with a radiant source of heat.

There is another disadvantage of hot water from a central boiler, namely, that all rooms are heated all the time and if they are warmed to full comfort temperature a considerable amount of heat is wasted in unoccupied rooms; this is one of the reasons why such systems, while they may be "the cheapest form of central heating" are not in practice any cheaper than electric heating which can be adjusted to the varying occupation of domestic premises.

Reverting to the main problem of the best type of electrical installation, experience shows that the solution lies in a judicious compromise between radiant heat with its practically instantaneous action but limited effect from a small source like an electric fire, and the more pervading but slower-acting convection heating.

What is really required is that the walls, floor and ceiling of a room must never become too chilly; in the words of the heating engineer the mean radiant temperature must not be allowed to fall too low, otherwise an unduly high air temperature or an undue intensity of radiant heat is required to counteract it.

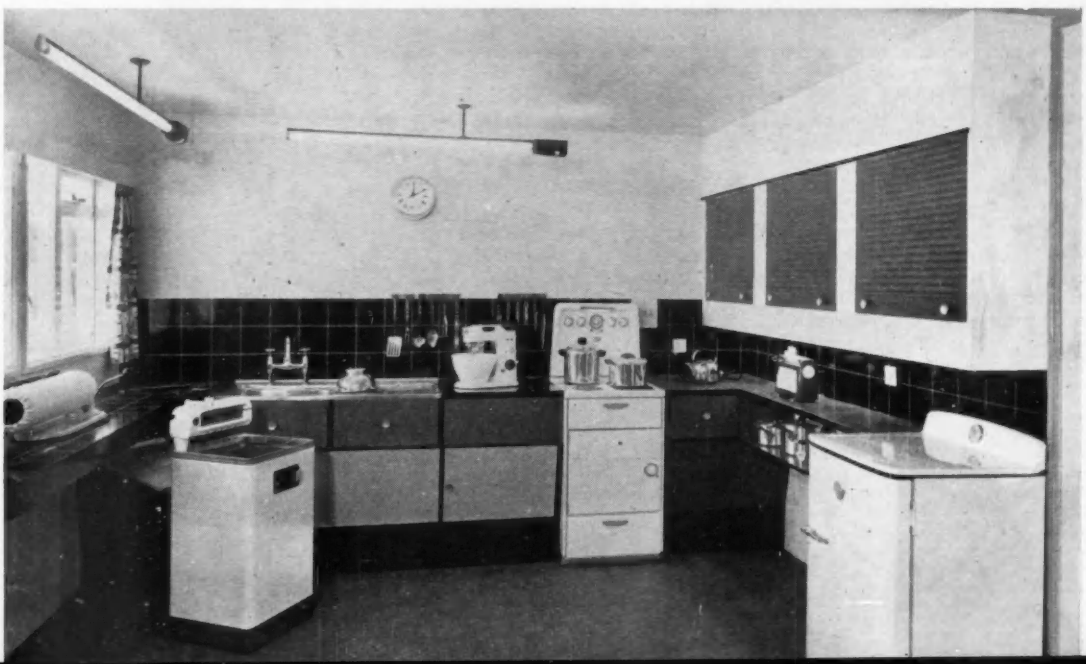
One of the earliest practical solutions on these lines for a living room, for example, was to have a tubular heater, or more recently a convector or oil-filled "radiator," placed against the outer wall of the room and switched on during the day in fairly cold weather or day and night during very cold weather. This provides what has come to be known as "background heating" and the thermostat, which is always desirable to prevent overheating on mild days, should be set so as to provide an air temperature of about 50°F. This will ensure that the walls of the room never become too chilly, and an electric fire—a high-temperature radiant source of heat gives the most agreeable kind of warmth to sit by—can be switched on when the room is occupied.

In bedrooms the best form of electric heating depends on personal taste. The majority of people in this country like to sleep with their bedroom windows open which means that convective heat will be lost, so it is more economical to have an electric fire switched on for dressing and undressing. Incidentally, a switch by the bedside wired in series with the socket supplying the fire is a great convenience on a cold winter's morning. Another convenient accessory is a neat timer which can be fixed alongside a socket to switch on an electric fire or other heater after a pre-selected time so that the room can be heated for an hour or more before it is occupied. To the extent that this avoids waste of heat in unoccupied rooms it is another instance of a saving in heating costs made possible by electricity.

Floor Warming

The latest development which is already on the way to creating a revolution in heating technique consists in using the floor of a room as an important source of background heating capable of supplying all the warmth necessary during the daytime except when the room is occupied for sedentary purposes when floor warming may be supplemented by an electric fire which in this case can be of less than normal loading.

All-electric kitchen showing (left to right) rotary ironer, washing machine, mixer, cooker and refrigerator



The floor is warmed by heater cables buried in the solid concrete of which ground floors are now usually constructed. The surface temperature seldom exceeds 75°F and the whole floor acts as a low-temperature radiant source which gives a most agreeable combination of gentle radiation and conduction, the desirable "warm feet and cool head" effect which is so difficult if not impossible to produce by other methods. As heating cables can be buried in a floor only when a house is being built, an alternative is now being supplied for existing houses. A number of manufacturers of carpets and other floor coverings are producing underlays with low-loaded heater wires embedded in them—rather after the fashion of a large electric blanket—to produce the agreeable warmth of floor heating in existing rooms.

In new houses and flats solid concrete floors provide an ideal form of thermal storage so that electricity can be supplied during the night on an off-peak tariff at an appreciably lower unit rate. But this is not the only economy achieved by floor warming; as the temperature of the floor is very little higher than that of the air above it the heating system is to some extent self-regulating since a rise in the air temperature will reduce the heat given off by the floor.

All-Electric Houses and Flats

Other economies secured by all-electric working are the omission of chimneys, flues and fireplaces, together with fuel stores, to say nothing of the saving of labour in laying and tending fires, clearing away ashes and all the extra cleaning that the dust and dirt produced by solid fuel inescapably involves.

In tall blocks of flats the savings in the cost of construction by floor warming are so large as to be almost the deciding factor. No housing authority would, however, take advantage of such savings unless there were an assurance that tenants' running costs would be reasonable. This latter question was put to a practical test first at the now well-known eight-storey block of flats built by the Kirkcaldy Corporation at Valley Gardens which not only incorporated off-peak floor warming but also an off-peak water heating system for each flat and where the running costs each year have been appreciably less than the estimates on which the scheme was originally approved. Since this building was opened in June, 1955, the flats have been visited by over 100 deputations from housing authorities in all parts of the United Kingdom. What is most interesting is that the Kirkcaldy tenants have been the best "salesmen" for this concept of home comfort because the running costs cannot be approached by any other system or combination of methods. Representative examples of all-electric council flats are shown in accompanying illustrations and a recent survey showed that at least half the council flats under construction were having electric floor warming installed.*

Houses, of course, take more heating than flats, but experience shows that all-electric operation can be as economical as other methods especially when the savings due to reduced labour, cleaning and redecoration are taken into account. Some householders have found this out for themselves as indicated in a letter to the *Manchester Evening News* entitled "I'd plump for electricity every time." The writer, a research chemist of Higher Blackley, described how he made his three-bedroomed house, with a 22ft by 11ft lounge, all-electric by replacing the coal fire with a 2 kW fire and two ½ kW convectors at the back of the room. The running costs for the year amounted to £41 10s, or an average of 16s a week, which should be compared with the total of coal, gas and electricity bills for the ordinary home. The writer stated that he used to spend about 15s a week on coal and about 10s a week on gas and electricity combined, so that the benefit was striking. In addition, the lounge was heated in a much shorter time and more evenly than by a coal fire. Another important advantage, the letter concluded, is that electric heating can be switched on and off as required and this is one of the many reasons why electricity can be cheaper than coal.

Here it should be noted that householders will pay separate bills for coal, coke, gas and electricity without adding them together to see how they compare with all-electric bills.

All-electric houses are being designed and built in increasing numbers. In the 30 winning designs in the Small House Architectural Competition recently organised by *Ideal Home* and the R.I.B.A. no fewer than twelve designs specified electric floor warming. A notable estate at Woking is shown in another illustration; it consists of three-bedroom houses in which the running cost averages 27s 6d a week over the whole year which may correspond to quarterly bills of £10 in the summer and £26 in the winter. Apart from seasonal differences there are, of course, a number of variations in running costs from one household to another, depending upon the size of the house, number in family and different standards of personal comfort. Another point to note about these Woking houses is that none of the occupiers regrets not having a coal fire; in fact, the chimneys which were built on one or two of the first houses have since been taken down.

All-electric houses are not confined to the South; see, for example, the illustration of Mr. Boyd Anderson's new house near Edinburgh.

A review of all-electric heating cannot be concluded without some reference to the importance of thermal insulation of the building structure. This is now generally recognised as an improvement which is worth while in the interest of fuel economy generally, and electric heating enables the savings due to reduced heat losses to be realised to the full.

Appreciable savings can be made by simple forms of insulation which cost relatively little, e.g. fibreglass over the bedroom ceilings and, if the house is being built, insulating blocks instead of bricks for the inner leaf of cavity walls. Greater savings are possible by still better forms of insulation as was shown by Mr. A. H. T. Broderick, then chairman of the Structural Insulation Association, by building in 1955 a house for his own occupation with "U" values of 0·1 or less. The running cost of all-electric operation of this ten-roomed house was found to average 34s 3d a week, or little more than most houses of half its size.

The consumption of electricity in domestic premises has more than doubled in the last ten years. This has been reflected in bigger business for all sections of the electrical industry including the makers of power station plant, transformers, switchgear and cables. It is safe to say that consumption will continue to increase, but if everyone in the industry sets an example and tells his friends about the real economy of an all-electric home, without leaving them to discover it for themselves, the rate of increase will be very much greater.

* The subject of electricity in council flats is dealt with in more detail in the succeeding article, by Mr. J. W. Moule.—Eds. *Electrical Review.*

Blocks of all-electric council flats with electric floor warming at **(1)** *Cardiff,* **(2)** *Stockwell, London,* **(3)** *Wolverhampton,* **(4)** *Motherwell,* **(5)** *Glasgow and* **(6)** *Birkenhead*

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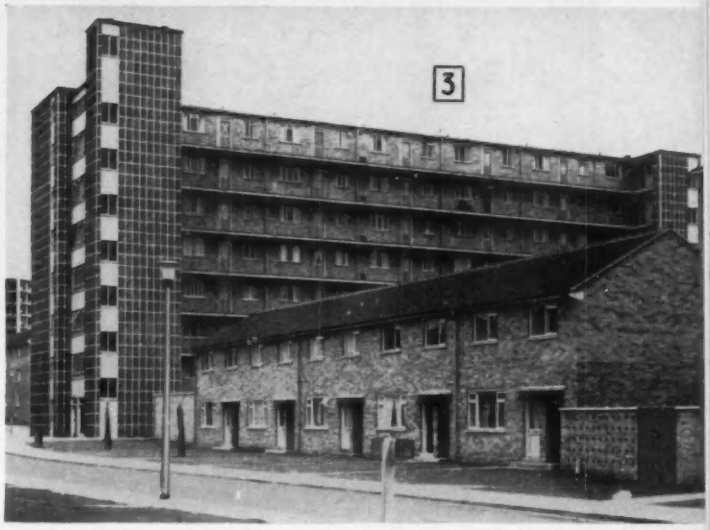
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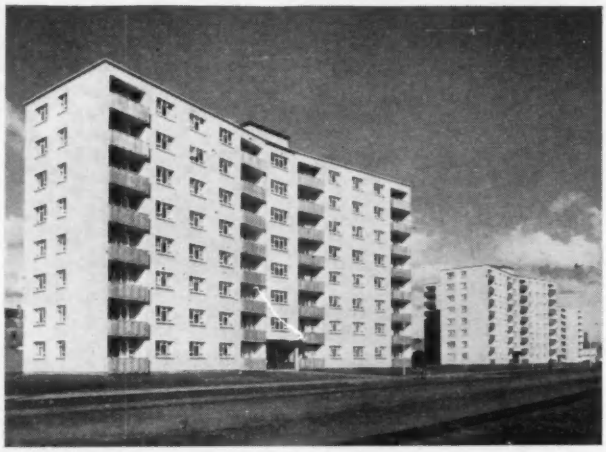


Left: The original Valley Gardens flats, Kirkcaldy, which about a hundred delegations from other authorities have visited to inspect the floor-warming installation. Right: Three blocks of electrically heated flats at The Links, Kirkcaldy

A SINGLE multi-storey block of "all-electric" flats can set up a maximum demand (off-peak) of 600 kW and take over a million kWh per annum. These figures indicate the great importance of the "tall" flats building technique, not only to Electricity Boards, but also to electrical contractors and manufacturers, as large sums of money are involved in the purchase of electrical equipment and in the provision of the extensive internal wiring systems. The equipment includes such general items as lifts, communal laundries, stair lighting, etc., and the apparatus installed in each tenant's flat. We are concerned with the latter in this article.

Electricity is indispensable in all new housing for lighting and television. Its increasing use for power purposes in the home is bringing out a recognition of the need to provide more socket outlets and much more is required to be done in this connection. Many housing authorities provide wiring facilities to permit the ready installation of water heaters and the great increase in the sale of these appliances, particularly immersion heaters, shows that many tenants take advantage of these facilities. Cooker circuits or tubing are also frequently provided to permit tenants, if they so choose, to cook by electricity. Again, the remarkable expansion in the sale of electric cookers and the ever-increasing proportion of local authority tenants who choose electric cooking, suggests that, ultimately, the electric cooker will become generally accepted.

Flats in the first stage of the Gorbals (Glasgow) redevelopment plan equipped with electrical floor warming

Sales of cookers and water heaters by the South of Scotland Electricity Board increased by 54 per cent and 48 per cent respectively in the year ended 30th June, 1959, as compared with the previous twelve months. The increased tendency for local authority tenants to choose electric cooking is shown in the following figures for a new town in the South of Scotland:—

Year	No. of Houses Connected	No. of Electric Cookers Installed	Per cent
1955	756	284	37·6
1956	886	390	44·0
1957	738	428	58·2
1958	747	546	73·0
8 months to Aug., 1959	515	396	77·0
	3,642	2,044	56·1

It is usual for local authorities who erect electrically floor heated blocks of flats to install an electric cooker in each flat and this has led to some criticism. The following extract from the *Gas World* of 11th April, 1959, is of interest:—

> "Market research among the occupants of an all-electric housing development, where there had been no choice for tenants, showed that, within two or three months, people who would have preferred a gas cooker originally have become conditioned to electric cookers.

BLOCKS OF FLATS

By J. W. MOULE, B.Sc.(Eng.), M.I.E.E.

EXTENDING THE USE OF FLOOR WARMING

The South of Scotland Electricity Board has been a pioneer in the introduction of electrical floor-warming systems in flats and has fostered these, and electric water heating, by means of off-peak tariffs. The author, who is the Chief Commercial Officer of the Board, shows how economical electrical methods have proved to be

"About two-thirds of the housewives in the block were interviewed and, of these, at least a third said that, if there had been freedom of choice, they would have chosen a gas cooker. Since then the percentage of those who still wanted a gas cooker had become very small indeed."

In the space heating field, electricity has long been accepted as the best means of providing short-period heating such as is required in bedrooms. It is only in the last few years, however, that general interest has been aroused in its use for whole-house space heating, although there are many who have long employed it for this purpose on account of its cleanliness, flexibility, and labour-saving virtues. Now electrical whole-house space heating is taking on in a big way, largely on account of the ease and low cost with which electrical floor warming can be installed in new buildings with concrete floors. This development is a consequence of the success obtained in the last ten years in applying electrical floor warming to large commercial and industrial premises. In this connection it is of interest to mention that a visit to the Health Centre at Sighthill, Edinburgh, in 1953, finally convinced representatives of Kirkcaldy Corporation to proceed with electrical floor warming in the original Valley Gardens eight-storey block of flats. As is now well known, this block of flats was the forerunner of many similar buildings either built or in course of erection throughout the United Kingdom.

There can be no doubt that electricity is now in a position to make a strong bid to capture the whole of the space heating load in dwelling houses, particularly blocks of flats, and it may well be that we are on the threshold of one of the most important steps in the history of the utilisation of electricity. The main considerations influencing this development include:—

1. For "tall" blocks of flats in particular, it is cheaper to install a form of central heating rather than provide fireplaces, grates and flues for the burning of solid fuel in each flat.
2. From the tenants' point of view, central heating can be enjoyed at comparatively low cost as the heat loss per flat is much less than that of a similar-sized cottage type house.
3. Electrical floor warming has several important advantages over other methods of central heating:—

(i) It is the cheapest and simplest system to install. No central boilerhouse, chimney, or flues of any description are required.

(ii) Because of the thermal storage properties of the concrete floor, tenants can take electricity on an "off-peak" basis and obtain the benefit of the cheaper "off-peak" tariffs.

(iii) The heating in each flat is under the direct control of the tenant who pays for the electricity he uses. The housing authority is not involved in charging out average costs to each tenant who, in these circumstances, has no inducement to be economical.

Electrical floor-warming cables can either be solidly

Edinburgh has also adopted electrical floor warming; these tall-building flats are at Pilton

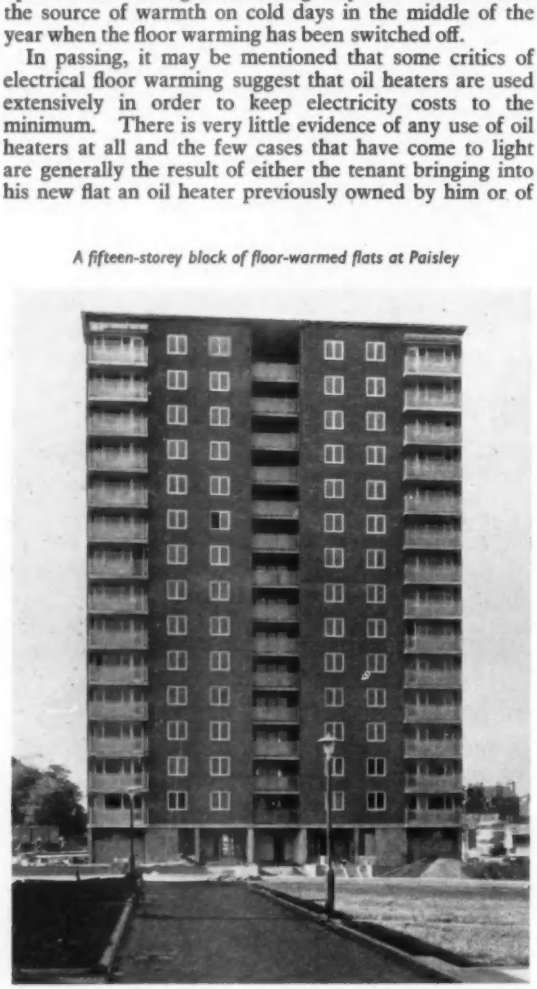
embedded in the concrete floors or drawn into conduit which is itself embedded in the floor. In the case of blocks of flats, the former system can cost about £15 per kW including cost of installation and control equipment, whereas the latter system can cost about double that figure. The withdrawable type of floor warming was used in the first blocks of flats on account of an understandable doubt of what could be done if a heating cable failed. The development of a highly accurate fault locator has, however, done much to establish the solidly embedded system, with the result that it is now the more commonly used type of floor warming.

A survey recently carried out of " all-electric " multi-storey blocks of flats showed that floor warming is installed in the living rooms and also in the hall or kitchen or both. More exceptionally the bathroom and bedroom are also heated.

The electrical loadings are usually designed to provide a good standard of background warmth to maintain, say, the equivalent of 60°F in severe weather. The electrical loading is usually between 3 and 4 kW depending on the size of the flat and its position in the block. Supplementary heating is supplied by a 2 kW panel electric fire, generally provided by the housing authority and often of the coal effect type. This fire is available to give topping-up heat in the living room during very cold weather or as the source of warmth on cold days in the middle of the year when the floor warming has been switched off.

In passing, it may be mentioned that some critics of electrical floor warming suggest that oil heaters are used extensively in order to keep electricity costs to the minimum. There is very little evidence of any use of oil heaters at all and the few cases that have come to light are generally the result of either the tenant bringing into his new flat an oil heater previously owned by him or of the housing authority not providing an electric fire for supplementary heating. In some cases oil heaters are forbidden in " tall " blocks of flats on account of fire risk.

A fifteen-storey block of floor-warmed flats at Paisley



Another supposition is that tenants in centrally situated flats might switch off their floor warming and live on heat transmitted to them from their neighbours, particularly the one immediately above. This could happen on a limited scale, but the inclusion of a combined sound deadening and heat insulation quilt reduces possible heat transmission to the minimum. Analyses of the off-peak electricity consumption show appreciable variations in the use tenants make of their off-peak supplies, but it is difficult to distinguish between the consumption for floor warming and for hot water. Visits to the Kirkcaldy flats in particular have revealed that a very substantial majority of the tenants use floor warming in the manner intended, although a few use the living room floor warming only.

From the Electricity Board's point of view, it would be preferable if the floor warming installation were capable of providing all the warmth required, as extended use of the ordinary electric fire might result in its being used at the time of the system maximum demand. The occupants of these types of flats, however, do not generally require such a high standard of central heating and they would probably object to the cost. Undoubtedly, the most economical arrangement is to provide good background warmth, supplemented as necessary by an electric fire.

Careful observation has shown that the electric fire is not generally used at peak periods. At breakfast time the living room, having been unoccupied during the night, is usually quite warm and the electric fire is not required. Not much use is made of the fire during the day; it is not until after 6 p.m. that it is used to any extent. By this time the meal is over and the family relaxes for the evening. Later, of course, fires may also be used in bedrooms for short periods during very cold weather.

Water Heating

Where a housing authority has decided to install electrical floor warming in a block of flats, it is a natural consequence that electricity is also used for water heating. The installation usually consists of a 30 gallon storage water heater having a 3 kW loading. In the South of Scotland and, mostly in the rest of Great Britain, this water heater also operates on the " off-peak " electricity supply.

The view taken by those who prefer normal supply is that the slight saving is not worth the inconvenience of possibly being without adequate supplies of hot water when required. This is hardly borne out in practice in Scotland at any rate, where 30 gallons of hot water storage have proved to be quite enough for the tenants' requirements, particularly in those blocks where a communal laundry exists. This despite the fact that some of the tenants prefer manual control of the immersion heater.

It is arguable whether the water heater should or should not be connected to the off-peak supply. Reasons in favour of connecting it to the normal supply are that, with thermostatic control, there is a wide diversity in the times when the water heaters switch on, and that, if they are connected to the off-peak supply, very heavy loadings would be set up when both the water heaters and the floor warming installations switched on at the end of the electricity cut-off period. The advantage of connection to the off-peak supply is that the Electricity Board is quite certain that the water heaters will not add to its peak load.

It has been found that, even with water heaters connected to the same off-peak supply as the floor warming, the a.d.m.d. is about 5 kW per flat and, in practice, no embarrassment has been caused by very heavy loadings

at the beginning of the off-peak period. The balance of advantage undoubtedly lies with the connection of the water heaters to the off-peak supply.

Results in South of Scotland

The Kirkcaldy Valley Gardens block of flats was first occupied during 1955. It quickly became a centre of interest and now about 100 local authority deputations have travelled to Kirkcaldy from all parts of the United Kingdom to inspect the flats. It can be said that these deputations have been so impressed, not only by the low operating costs but, what is perhaps more, by the favourable reactions of the tenants, that many similar blocks of flats have been erected or are in course of erection throughout the country.

Kirkcaldy Corporation themselves were sufficiently pleased to proceed with the erection of three similar blocks of flats on their Links site. The successful experience at Kirkcaldy also influenced the Scottish Special Housing Association and Glasgow Corporation to install off-peak electrical floor warming and water heating in two ten-storey blocks of flats at Toryglen, near Glasgow. Edinburgh Corporation quickly followed with the erection of two ten-storey floor heated blocks of flats at Pilton.

Interior of one of the Valley Gardens flats

It is noteworthy that, as the Toryglen flats proved quite as successful as the Kirkcaldy flats, the Scottish Special Housing Association decided to adopt off-peak electrical floor warming and water heating as standard practice for all property built by them of four storeys or more in height. Furthermore, Edinburgh and Glasgow Corporations are now adopting electrical floor warming and water heating for most of their extensive multi-storey housing developments. Many other local authorities in the South of Scotland have also committed themselves to this method of space and water heating, and there can be no question that off-peak electrical floor warming has taken its place as the pattern for the future so far as multi-storey blocks of flats are concerned.

In all about thirty local authorities in the South of Scotland are to have all-electric blocks of flats with the result that so far as plans already decided go, there will be over 7,500 dwellings in which the tenants will be entirely dependent upon electricity for space heating, water heating, cooking, and the many other uses of electricity such as lighting, television, etc.

The following table gives details of the actual results obtained in all-electric flats which have been in occupation for upwards of a year.

AVERAGE WEEKLY COSTS OF BLOCKS OF ALL-ELECTRIC HOUSES ERECTED IN THE SOUTH OF SCOTLAND

Scheme	No. of Houses	1955–56	1956–57	1957–58	1958–59
		s d	s d	s d	s d
Valley Gardens, Kirkcaldy	24–2 Apartments	10 9½	9 4	11 4½	10 1
	24–3 ,,	14 3½	13 7½	14 4	13 7
Dallas Drive, Kirkcaldy	42–3 ,,	—	14 8	14 9	Not yet
(maisonnettes)	6–4 ,,	—	15 9	14 8	available
WestPilton, Edinburgh	40–2 ,,	—	—	—	9 9
	80–3 ,,	—	—	—	14 0
Gorbals/Hutchesontown re-development, Glasgow	30–1 ,,	—	—	—	9 1
	48–3 ,,	—	—	—	14 11
	18–4 ,,	—	—	—	18 7
Toryglen, Glasgow ...	60–3 ,,	—	—	14 0	13 7

The similarity in the results for the various buildings is quite remarkable. For instance, in the case of three-apartment flats, the average weekly cost varies from 13s 7d to 14s 11d although the buildings are in widely different situations. The consistently low overall average cost of electricity will provide further encouragement to local authorities to adopt electrical floor warming and water heating as standard for their multi-storey blocks of flats.

It would be interesting to compare the all-in cost of electrically equipped blocks of flats incorporating other methods of central heating. Unfortunately, few figures of actual results are available, and the only ones within the author's knowledge concern the Gateshead gas-heated multi-storey flats. According to a Scottish Gas Board article in the *Glasgow Herald* in August, 1958, the average annual cost of gas per tenant amounted to £36 10s based on Scottish Gas Board tariffs. In addition to using gas, each tenant used on average 659 kWh of electricity in a full year and, on the South of Scotland electricity tariff, this would have cost about £6 15s. The all-in cost to the tenant of gas and electricity was therefore about 16s 8d a week, a figure substantially in excess of the cost of the Scottish all-electric flats. It can be added that in the case of the all-electric flats, the tenants were entirely satisfied with the various services provided by electricity.

Industrial Electric Heating

A PREVIEW of a colour film "Industrial Electric Heating" was held in London recently. The film, produced for the Electrical Development Association by Verity Films, Ltd., deals with the theory and practice of electrical process heating of all kinds in most industries, including motor cars, ceramics, plastics, furniture, chemicals, etc. Throughout the film the controllability, cleanliness and easy availability of electric heating at the site of the job are emphasised and the producers are to be congratulated on some of the scenes depicting metal-melting which have probably never been better photographed.

The film is designed for showing to factory managers and others whose technological experience is likely to be associated more with their own trade than with things electrical. Students should also be interested and indeed students appearing in the film are used to justify the interpolation of diagrams and theoretical considerations.

The running time is thirty minutes and copies are available, on free loan, in both 16 and 33 mm sizes from the Association, 2, Savoy Hill, London, W.C.2.

VIEWS on the NEWS

By REFLECTOR

WITH the Electricity Boards carrying on so much hire-purchase business it is surprising that they seem to confine it to appliances; I do not hear of "assisted" or "free" wiring installations nowadays. Before nationalisation many municipal electricity undertakings had schemes by which the wiring was carried out either by the undertaking or by private contractors and was paid for by an addition to the "unit" charge (a halfpenny or a penny usually). The extra charge was generally collected by an adjustment of the prepayment meter. I should have thought that this was still a good way of developing the domestic load and probably of ensuring adequate installations. Do the Boards consider this facility unnecessary today or are there other reasons why the system appears to have fallen into disuse?

* * *

Another practice of some of the former electricity supply authorities which has been abandoned is the granting of a discount for the prompt payment of electricity bills. No doubt this introduced complications and might be troublesome in a mechanised accounting system, but a good many people were encouraged by the discount to pay on the nail. I am reminded of this by a statement attributed to Mr. T. E. Daniel, chairman of the North Western Board, that each quarter one out of three of the Board's 1,430,000 domestic consumers has to be reminded that he has not paid his bill, and that several thousand pounds would be saved annually if the printing and postage costs of this were eliminated. This makes it look as though discounts might be worth while.

* * *

Discussing the subject of nuclear power in this country, the *Economist* said recently:—

> "Each consortia contains its own turbine makers, its own boiler manufacturers and in some cases its own civil engineers. When two consortiums merge, whose boiler blows the steam into whose turbine?"

Does this not embody a singular use of the plural—and *vice versa*? Why not stick to "groups"?

* * *

As I expect most of my readers know, block storage heaters are at present sold for use only in commercial and industrial premises. With this limitation they are not subject to purchase tax; if they were supplied for domestic use the whole of them would have to bear tax. Repeated efforts have been made to alter this situation because these heaters can form a useful off-peak load but subjecting them to the tax would probably put them out of reach. Now the *Guardian* has reported of a company director in the London area who thinks he has found a way round the rule. He asks what is to stop him purchasing a block storage heater which has been installed in his works and placing it in his home. As second-hand equipment it would not be taxable and the original suppliers of the heater for industrial purposes could not be held liable for its transfer to other uses. The director apparently tackled the Customs and Excise authorities on the subject, but their reply, as printed, is to my mind not very definitive. The London Electricity Board, which was asked to quote an off-peak tariff for the heater, has declined to play; it frowns on any attempt to circumvent the regulations.

* * *

Seaboard (the South Eastern Electricity Board's magazine) says that among peculiar requests emanating from consumers was a recent one received by the Board's West Kent street-lighting department. A number of street-lighting columns had been erected in one of the rural areas and the department was asked if it could adjust one of them outside a particular property to make it slope in conformity with the house. I am not quite sure what this means. Did the house lean over backward or forward, or was it set perpendicularly on a slope? Anyhow, the journal asks "Do they have such requests in Pisa?"

* * *

The only practicable methods of electric lighting eighty years ago involved the use of the carbon arc, but the embryos of later systems were already in existence. In a leading article on the subject in the issue of 15th October, 1879, the *Electrical Review* said:—

> "Mr. Crookes [later Sir William Crookes] is engaged in some experiments with the electric light in vacuo, which promise to work an entire revolution in the prospects of the light. Carbons would be dispensed with, and the lamp would consist in a luminous globe giving a light of, say, three candles. Thirty of these lamps would, it was thought, be maintained by an expenditure of 1¼ horsepower, at a cost of less than a penny per hour. We have always believed that there was something to be made by someone in the way of electric lighting out of Mr. Crookes' researches in vacuo, and we are gratified to hear that that eminent physicist is so near success himself. Mr. Edison and he are trenching upon the same ground with vacuo; but, whereas the former uses metal electropyres the latter uses none. Both are on the proper track it seems to us, namely, the production of a perfectly steady light without any wasting of carbons or other perishable parts. As yet, however, Mr. Edison's method would seem to be the more economical of the two."

* * *

One of the "gems" quoted by the *New Zealand Electrical Journal* from answers to questions set at an electricians' examination is the following:—

> "If a satisfactory test figure (for resistance to earth) cannot be obtained, reference could be made to the regulations to see if the installation comes under any of the exceptions therein."

Designing for the Housewife

THE MANUFACTURER'S APPROACH TO A MANY-SIDED BUSINESS

By THOMAS DAVIDSON*

The domestic electrical appliance designer's aim is not merely to meet the customer's requirements but also to endeavour to anticipate them by studying the market. His task necessitates a knowledge of many materials and manufacturing processes and Mr. Davidson shows how many factors have to be taken into account

"WHY doesn't somebody make . . . ?" To every manufacturer in the appliance industry, these words have a well-known ring; from the pages of women's magazines, from personal letters, and even in private conversations, they sound out at him with monotonous regularity. It is an occupational hazard of the domestic appliance designer that almost everyone he meets has a pet idea for some ingenious gadget which, it is usually claimed, would completely solve the housewife's problems.

The real problem facing the designer, however, is to anticipate the needs of the user some time ahead, and frequently before she will be aware of them herself. A new appliance cannot be put into production in five minutes, and before he embarks on a costly programme of tooling-up and planning for mass production, the manufacturer must make certain that a substantial demand exists, and will continue to exist for a reasonable time. In order to do this, and at the same time keep pace with competition, both at home and from abroad, an increasing amount is being spent by British appliance manufacturers on intensive and continuous research into the changing requirements of present-day domestic living. The general effect of this policy is that a major revolution is today taking place in the design of appliances which for years has followed traditional and well-defined paths. An examination of some of these changes, together with an outline of the problems encountered by the designer, is presented here to show some of the things the manufacturer is doing to give the housewife what she wants.

This cooker exemplifies compact design with a large oven space, flexible heat control for the hob, and automatic oven timer control. It has a lipped hob to prevent pans upsetting accidentally and an inner glass oven door and oven light. Switches are mounted at waist height and oven and 5-hour ringer are on a tall control panel which protects the wall behind

What does the Housewife Want?

Of all the major appliances, the cooker is undoubtedly the most important to the housewife. There is no question about the desirability or otherwise of possessing one; nor is there any disagreement as to the fundamental requirements to be met, for the British housewife at least: an oven, a grill, and a number of surface heating units. Within this broad agreement, however, there exists a much wider, and much more positive, divergence of personal preference than with any other appliance.

In general, the current wishes of the public appear to us to be: an attractive appearance; clean, smooth lines; a large and accurate oven; more and faster boiling plates, and larger grills, within a reasonable overall size. Coupled with these are ease of cleaning, and, less often mentioned but equally important, simplicity of operation. The first three requirements have been partly met by the universal adoption of the full-width oven, and the removal of the old switch compartment. The demand for better boiling facilities has given rise to cookers with three, or even four, boiling plates; or, for the housewife who prefers the undoubted convenience of the grill boiler, by fitting, in addition, two high-speed radiant plates as a standard item. Both of these developments present immediate problems in design: where to put the controls, and where to put the grill.

Controls have moved to the sides of the grill chamber, or to the back splashplate. The former position is at a convenient height for the user, and simplifies the wiring connections to the boiling plates; on the other hand, the grill chamber is slightly reduced in width. The splashplate position makes for easy reading and is well out of the reach of small children, but introduces complications in making the connections. There are three practical alternative positions for the grill: in the oven, in a separate grill chamber, or on the splashplate.

The so-called "eye-level" grill can be of large size, the

* English Electric Co., Ltd.

user can easily watch the grilling operation, and the oven can be lifted to a more convenient height with the disappearance of the grill chamber. The advantage of the large grill is somewhat offset, however, by the awkwardness, to a short user, of lifting a fully-loaded grill pan up to eye level. In addition, a fairly rigid structural support is required, which is inherently costly and not easy to clean.

The grill in the oven can again be of large size, and makes for an inexpensive construction, since no other grill chamber is required. Contrary to a widely-held belief, the problem of baking and grilling simultaneously is not a serious one (in the writer's own experience over a period of five years, only on two occasions did this conflict actually arise). It has, however, the disadvantage that the oven door must be kept open during grilling; with a large oven door at a low level, this can be a nuisance in a small kitchen.

The third grill position, in the hotcupboard, also allows a large grill, and is at a convenient height, while leaving the splashplate free for the control switches. In order to avoid excessive temperatures around the boiling plate connections, however, it has to take up quite a lot of vertical space below the hob, and if the hotcupboard is of reasonable size, the oven must be lowered almost to floor level.

Examples of all four types are available on the market, and the housewife may decide for herself which is the best suited to her own requirements.

Solid or Radiant?

The most frequently-heard criticism of electric cookers has always been the slowness of the "hob." Recent advances in boiling plate design have, however, gone far to dispel this complaint, and today's performances fully justify the description of "fast-boiling."

Radiant plate loadings have been increased, and the latest designs give a much greater area of possible contact with the pan than did the early models, resulting in better heat transfer and longer service life. Equally good results may be obtained with aluminium or vitreous enamel pans. In other models the thermal capacity has been reduced, and the loading increased, resulting in shorter heating-up times and faster response when the setting is lowered.

The old-fashioned heavy solid plate is slowly disappearing and giving way to a lighter, more efficient type. Higher loadings enable reasonably fast boiling to be achieved, and in one case an initial "boost" loading of 3 kW, applied for three minutes, enables the loading to be increased considerably above the value which would be safe for continuous operation. The solid plate is easier to wipe clean than most radiant plates and is cheaper to make; on the other hand the radiant plate is rustproof, does not require accurately flat pans, and is not so liable to loss of efficiency through distortion.

The boiling times of both boosted-solid and high-loaded radiant plates are comparable, but the solid plate is not quite so responsive to switching-down because of its greater mass.

Trends in Cooker Design

It would be inappropriate in an article of this nature to attempt to predict with certainty what will be the long-term trends in cooker design. Each manufacturer will, in any case, decide what he considers to be the most marketable features, and base his designs accordingly. There are, however, several commonly-known features which are currently under consideration, and which are worthy of comment as probable developments.

The general design trend is towards cleaner, simpler lines, with more careful attention being paid to appearance design. Ease of cleaning, ease of operation, and ease of maintenance are all items on which the designer is laying greater stress in the up-to-date and coming models. Automatic timers are here to stay, and are becoming more and more a standard item, or at least an optional feature on any new model. Hob-mounted boiling plates of both the solid and radiant variety are likely to rival the plug-in type.

Temperature control of boiling plates is another feature which will probably receive increasing attention, as it will bring greater freedom from "pot-watching" to the user. A number of design problems are, however, associated with this, not the least of which is the cost involved. Split oven and hob units, and built-in units, have already appeared on the market, and more will undoubtedly come along.

The comparatively high cost of these, however, together with the installation problems of fitting the two units into the average small kitchen, would appear to preclude them from supplanting the free-standing complete cooker in any major quantities. If there is sufficient demand for this type of cooker the housewife will have to persuade builders and architects to allocate her adequate space for the kitchen, instead of the cramped quarters so often found in new housing.

Keeping Pace with Outside Developments

One of the pitfalls which the appliance designer must avoid is that of working in a watertight compartment; at the same time as he is developing and perfecting designs of labour-saving equipment for the home, scientists and technicians in other industries are busily engaged in formulating a host of new preparations and processes, all

This raised oven cooker is fitted with quick-boil "Vee-line" radiant plates and a glass port in the door. The large grill is at eye-level at the top of the oven and the cooker has automatic timer control for the oven and warming cupboard, and a roomy storage cupboard

Power-rinsing in a washing machine. One hose pours in clean water from the tap, and the soapy water is automatically pumped away. The agitator moves the clothes mechanically through the water, and they are passed only once through the wringer. The agitator covers the drain cap so that the water flows freely even when clothes are in the tub

aimed at reducing drudgery in the home. Much of this work can exert a profound influence on the design of domestic appliances, and it is an essential part of the designer's business to keep in close touch with these outside developments. Probably in no branch of appliance manufacture has this been so marked as in the field of home laundry equipment.

The intensive development and marketing of synthetic detergents, while resulting in easing the task of the housewife, has brought in its train a number of new problems for the washing machine designer. One of the first of these was corrosion of metal parts in the machine by the early detergents, most of which contained fairly strong alkalis. This problem was tackled in two ways—by the increased use of plastics and corrosion-resisting finishes in the machines, and by the addition of inhibiting agents in the detergent. As synthetic washing powders have become more complex, further requirements have been imposed on the washing machine; at the same time, the way has been opened to new facilities and techniques.

Higher washing temperatures have created a demand for built-in heating elements; the ability to rinse in cold water has led to provision for power rinsing, with its attendant reduction in handling of the clothes.

Apart from the revolution in washing powders, a fundamental change has been taking place in the materials of the clothes themselves, with the extensive use of synthetic fibres in place of natural fibres. The behaviour of these materials, and of the fabrics made from them, is rather different from that of cottons and linens, and poses certain problems. Most of these synthetics are thermoplastic, tending to soften if washed in very hot water and forming wrinkles which are difficult to remove. Also, although materials such as nylon and "Terylene" are very tough and wear-resistant in themselves, they are frequently made up into delicate fabrics and garments, which will readily form creases if subjected to excessive pressure when hot, as in heavy wringing or prolonged centrifuging.

In general, synthetic materials of this type are more difficult to soil than cotton or linen, on account of their non-porous structure. On the other hand, certain types of soiling are more difficult to remove, and this difficulty is aggravated by the lower washing temperatures required. "Drip-dry" materials of the resin-treated cotton type should also be washed at lower temperatures.

An intensive programme of research and practical testing is being carried out by the appliance manufacturers at the present time. So far, this has established that the synthetic fabrics may be successfully washed in any of the three principal types of washing machine available today, provided the precautions outlined above about excessive temperatures and pressures are observed. The results obtained will depend on the degree of judgment exercised by the user, who has complete control of each function.

While the detailed results of the test programme are not yet complete, it is expected that these will provide data of the optimum conditions for each type of fabric, in terms of temperature, washing time, amount of soap or detergent to be used, and extent of rinsing required. With this information to hand, a machine can be designed to produce accurately the required conditions for each type of washing load.

Automatic Washing Machines

There are two distinct types of machine in this class, both of which will give accurately controlled washing conditions. The semi-automatic has separate controls for temperature, washing time, rinsing, emptying, and spinning. The user selects the required conditions in turn, while the machine will automatically control these. The fully automatic machine goes a stage further. The user simply sets the control to determine the temperature, washing time, and rinsing programme for each type of washing load; the correct sequence of events is then carried out by the machine, from start to finish.

Materials and Methods

Of enormous assistance to the designer in the task of improving his own product, is the ever-increasing flow of new types of raw material on which he may draw for the purpose of fashioning his appliances. Whereas in pre-war days the average electric cooker had to be constructed from some dozen different materials, each of which imposed its limitation on the design, the present-day washing machine may contain upwards of fifty distinct substances, every one of which has been specially selected for the particular properties most suitable to the application, and many of which have been "tailor-made" to achieve those properties.

The general effect of all these new materials on the design of the appliance falls into two main categories. The first is to improve on the performance of existing materials in a given application, thus making the product more durable, more resistant to heat or corrosion, or cheaper to manufacture. For example, the large selection of synthetic enamels—epoxy resins, melamine resins, alkyd resins—which today are almost universally used on the "painted" surfaces of appliances, have resulted in a finish which is heat-resistant, corrosion-resistant, tough, and colour-fast.

The second, and more far-reaching, effect, has been to make possible completely new techniques which in many cases have radically altered the basic design of the appliance itself. A well-known example of this occurs in domestic refrigerators. Until comparatively recently, refrigerators almost always consisted of an inner steel compartment, either vitreous or synthetic enamelled, which was mounted inside a sheet steel outer casing, the space between being filled with thermal insulation, usually

In this 4 cu ft table top refrigerator, measuring 20½in across, shelves and fittings can be changed around to make space for all the items in everyday use as well as specially large joints, etc.

glass fibre. In order to prevent excessive heat flow across the front edges of the cabinet, it was necessary to reduce the contact between the two boxes to the minimum possible. This led to the adoption of a four-point mounting at the corners and the fitting of plastic " breaker-strips " to close the gap.

The development of vacuum-forming techniques makes it possible to take a flat sheet of polystyrene, heat it up to the softened condition, and draw the plastic sheet down into a mould, by exhausting the air from below. The result is a one-piece compartment, free of joints, which can be screwed directly to the outer cabinet in a straightforward manner, completely eliminating the breaker strips, and doing away with the necessity for complicated and expensive tooling of the cabinet itself. Any number of grooves can be incorporated to accommodate sliding shelves, thus giving the housewife a wide choice of interior arrangements. Together with the improvement in the food compartment, the same process lends itself particularly well to the manufacture of door liners in intricate shapes; thus storage compartments can be specially fitted for bottles, eggs and other goods in a way which would be difficult and much more costly by other methods.

Many of these new materials have been developed, in the first instance, for purposes entirely divorced from domestic appliances, and their possible uses are not immediately obvious. The designer must therefore be continually on the lookout, and must take a broad interest in all that is going on around him in other fields, in order to reap the full benefit of progress on this front.

Housewives' Choice

So far an attempt has been made in the review of appliance design to indicate some of the major factors which influence the designer in his task of anticipating the needs of the user. In theory, the application of these design principles and the correct interpretation of test results should produce a logical and successful design. In practice, however, this is not always the case. Women, who form the majority of our customers, are not always logical people, and in numerous cases a feature which was excellent on technical grounds has failed to sell simply because it was not liked.

In order to guard against this, an important part of the manufacturers' activities is today devoted to finding out, quite simply, what the housewife wants. This process is divided roughly into two methods; the first is the analysis of reports from demonstrators, sales representatives and service engineers, who are in constant contact with the customer, either directly or through the medium of dealers and Electricity Boards. By this means it is possible to assess the value of existing features, and to eradicate faults in design or performance which have become apparent in current models.

This process cannot, however, be applied in the case of new and unknown ideas, and extensive use is therefore being made of market surveys, carried out on small samples of the population. The greatest value to the designer, of this type of survey, lies in the assistance it gives in determining the outline specification of his design, e.g., for a cooker, size, price range, number of boiling plates, and so on.

A second and important application, however, is the proving of appearance designs, particularly such features as colour, shape of handles and arrangement of controls. These are normally carried out by the use of a number of " mock-up " models which demonstrate alternative arrangements.

The last word, appropriately enough, lies with the housewife herself. If the article is what she wants, she will buy it. The fact that she is continuing to do so in increasing quantities today is the greatest encouragement of all to the appliance designer in his task of creating leisure in the home.

Atomic Energy Symposium

IN his introductory remarks at the European Atomic Energy Society Symposium at Stockholm on 5th October, Sir John Cockcroft said that the production of economic nuclear power depended on the development of reactor materials technology and the production of long burn-up elements. Uranium metal fuel elements should conventionally achieve an average burn-up of 3,000 MW-days per tonne with a corresponding figure of 10,000 MW-days for uranium oxide elements, and in large graphite moderated reactors figures of 4,500 MW-days per tonne were often achieved. The limit was likely to be due to inadequacies in metallurgical development.

Experience was being accumulated by operating nuclear power stations and from testing small samples in research reactors, the first enabling sources of fuel element failure to be identified. These could be divided into faults in manufacture and handling, leading to leaky welds, and growth phenomena in " cold " elements causing strained cans and the development of slow leaks.

He said that the future of fuel elements seemed to lie in the ceramic field as temperatures increased and a greater understanding of how fission products, particularly gases, were held in ceramics and of the conditions leading to the build-up of internal can pressures was required. The effects of irradiation must be carefully considered and although it had recently been found that stored energy ceased to be a problem at high irradiation temperatures, dimensional changes became important and more information on this was required to help designers. He thought that the United Kingdom's three 10 MW DIDO/PLUTO type reactors would be adequate to meet the materials testing requirements in the current programme in which they were concerned with the development of four types of reactor—the " Magnox canned " stations, the advanced gas-cooled reactor using oxide fuel elements, the fast reactor and the " Dragon " project.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The electrical industry will be represented in the new Parliament by a number of well-known men and we give below the names of those who were successful at last week's General Election, with their constituencies in parenthesis.

Conservatives: **Mr. F. P. Bishop,** M.B.E. (Harrow, Central), director of Rediffusion, Ltd., and chairman of Morphy-Richards, Ltd. **Mr. Basil de Ferranti,** B.A., Graduate I.E.E. (Morecambe and Lonsdale), director of overseas operations, Ferranti, Ltd. **Mr. F. J. Erroll,** M.A., M.I.E.E., A.M.I.Mech.E. (Altrincham and Sale), formerly a director of Enfield Cables, Ltd., W. J. Furse & Co., Ltd., and other companies, and Economic Secretary to the Treasury in the last Government. **Sir Norman Hulbert** (Stockport, North), formerly a director of the British Thomson-Houston Co. and the Metropolitan-Vickers Electrical Export Co. **Sir Toby Low** (Blackpool, North), director, General Electric Co., Ltd. **Mr. R. L. Mawby** (Totnes), formerly maintenance electrician with the B.T.H. Co., Rugby, and past-president of the Rugby branch of the E.T.U. **Mr. C. I. Orr-Ewing,** O.B.E.(Mil.), M.A.(Oxon), M.I.E.E. (Hendon, North), director of A. C. Cossor, Ltd. **Mr. H. Macdonald Steward,** J.P. (Stockport, South), consulting engineer, British Insulated Callender's Cables, Ltd. Labour: **Mr. T. W. Jones** (Merionethshire), formerly personnel welfare officer, No. 4 Sub-Area of the Merseyside and North Wales Electricity Board.

Mr. A. M. F. Palmer, A.M.I.E.E., M.Inst.F., who has contributed Parliamentary articles to our pages for some time, failed to re-gain his seat for the Labour Party at Cleveland.

Mr. A. Calley, M.B.E., has been appointed manager of the London district office of Siemens Edison Swan, Ltd., following the resignation of **Mr. J. A. E. Trinder.** Mr. Calley takes over his new position on 1st November. Since 1952 he has been manager of the London branch of the London Electric Wire Co. & Smiths, Ltd., a member of the A.E.I. group of companies.

Mr. A. Calley

Mr. H. A. Parrott

Mr. H. A. Parrott has been appointed assistant home sales manager, Cable Division, of Siemens Edison Swan, Ltd. He succeeds **Mr. R. B. Tucker,** who has resigned from the company to take up another appointment. Mr. Parrott joined Siemens Edison Swan in May this year on a special duties assignment to the Cables Division. Previously he was with the Cable Makers' Association for thirty-four years, the last eleven of which were spent as secretary to the Rubber and Thermoplastic Cable Manufacturers' Association.

The Minister of Power has appointed **Mr. D. G. Dodds,** LL.B., to be deputy chairman of the Merseyside and North Wales Electricity Board from 1st January next in succession to **Mr. J. Rankin,** O.B.E., F.C.I.S., Companion I.E.E., who retires on 31st December at the age of 67 after seven years' service as deputy chairman of the Board.

Mr. Dodds has since 1957 been industrial relations adviser to the Electricity Council, having previously been chief industrial relations officer of the Central Electricity Authority.

Mr. D. G. Dodds

Mr. J. Rankin

He was educated at Rutherford College and at King's College, Durham University, and graduated at London University. He was admitted as a solicitor in 1936. Between 1936 and 1941 Mr. Dodds held appointments as assistant solicitor, and then as senior assistant solicitor to Gateshead Corporation, Co. Durham. From 1941 to 1945 he served in the Royal Navy and was commissioned in the Royal Naval Volunteer Reserve. He held the appointment of deputy town clerk, Cardiff, from 1946 to 1948, and from then until 1956 was secretary and solicitor to the South Wales Electricity Board.

Mr. Rankin is completing a career of forty-one years' service in the electricity supply industry. He was for many years director, secretary and general manager of the North Wales Power Co., Ltd., and associated companies and secretary to the British Power & Light Corporation, Ltd. He held the post of secretary to the Merseyside and North Wales Electricity Board from 1948 until taking up his present appointment in January, 1953.

In this issue the Electricity Council is inviting applications for the post of industrial relations officer which Mr. Dodds now occupies, at a salary of from £4,750 to £5,250 per annum.

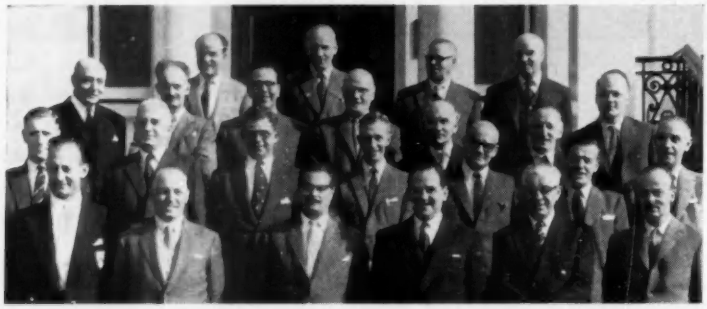
Mr. F. S. Grindrod, A.I.M.T.A., A.S.A.A., D.P.A., at present deputy chief accountant with the Eastern Electricity Board, is to succeed **Mr. J. E. Blair** as chief accountant on the latter's retirement at the end of the year. Mr. Grindrod joined the electricity supply industry in 1927 as a junior clerk in the Electricity Department of the Rochdale Corporation and later held senior posts with the Enfield Borough Council, Salford City Council, and Barking Corporation. He joined the Eastern Electricity Board as an assistant chief accountant when the Board was set up in 1948 and was made deputy chief accountant in 1951.

Mr. F. S. Grindrod

Mr. R. R. B. Brown, B.A., B.Sc., M.I.E.E., has been reappointed chairman of the Southern Electricity Board and **Mr. S. M. Rix,** F.C.I.S., F.S.A.A., deputy chairman.

Mr. P. E. Jackson has now taken over the South Wales area as technical sales engineer for Erskine, Heap & Co., Ltd. He took over the south-west of England area in August, and he will cover both areas from his address at 54, Station Road, Shirehampton, Bristol.

In accordance with its usual custom, the Scottish Section of the **Electrical Wholesalers' Federation** invited the Council of the Federation to hold one of its meetings in Scotland. This annual function was held at the Great Western Hotel, Oban, from 29th September to 2nd October and in addition to E.W.F. members, representatives of a number of other trade organisations were the guests of the Scottish Section. The E.W.F. Council meeting was held on 30th September and on the following day a golf competition was held, the winner of the cup being Mr. H. C. White, who also received the president's prize of a tankard. The second prize, which was also a tankard from the president, was won by Mr. A. McNeilage. Mr. T. S. Weston, chairman of the Scottish Section, presented jewel boxes to both



At the E.W.F. meeting held recently in Scotland. Back row (left to right): Messrs. F. Dunnet, W. H. McIntosh, R. W. Duncan, and R. E. Silvey. Second row: Messrs. A. Baillie, T. T. Young, J. M. Buchan, J. Aikman, Snr., J. W. E. Rutherford, E. H. Stein, and J. Aikman, Jnr. Third row: Messrs. J. A. Cartwright, C. H. Blackburn, P. B. Etheridge (director), J. Kerr (convener, Scottish Function), C. Hall Marr, A. McNeilage, and G. W. Cartwright. Front row: Messrs. G. Conradi (vice-president), W. S. Thain (Scottish section secretary), F. J. Blackwell (president), T. S. Weston (Scottish Section chairman), H. Riley, and J. H. Hirst

Mrs. W. E. Hind, the winner of the ladies' competition, and to Mrs. F. Dunnet, the runner-up.

At the dinner held in the evening Mr. Weston proposed the health of the guests, to which Mr. B. Keywood and Mr. F. J. Blackwell responded.

Mr. E. G. Batt, vice-president, was in the chair at last Tuesday's luncheon of the **Electrical Industries Club,** when Mr. Godfrey Talbot, senior news reporter of the B.B.C., gave a talk entitled "Round the World with a Microphone," in which he particularly referred to the recent Royal tour of Canada. A vote of thanks to the speaker was proposed by Mr. Batt, who announced that at the next luncheon meeting on 10th November the guest speaker would be Mr. C. Robertson King, the Club's president.

The **Electrical Industries Ball,** organised by the Electrical Industries Benevolent Association, will be held on 13th November at Grosvenor House, Park Lane, London, W. Mr. T. Pound (principal tenor) and Mr. D. Adams (principal bass) of the d'Oyly Carte Opera Co., have been engaged to provide the entertainment.

Mr. D. T. L. Rettie, M.A., and **Mr. B. W. Burnett** have been appointed joint managing directors of A.E.I.-Gala, Ltd. (the export company of the Hotpoint Group), and **Mr. R. Isdell-Carpenter** has been appointed director of administration and secretary both of A.E.I.-Hotpoint, Ltd., and of A.E.I.-Gala, Ltd. **Mr. J. D. Lake,** who joined A.E.I.-Hotpoint, Ltd., earlier this year and has been general sales manager since 1st July, has assumed executive responsibility for sales.

Mr. Rettie, who is also marketing director of A.E.I.-Hotpoint, joined the Hotpoint Company in July, 1956.

Mr. Burnett joined Associated Electrical Industries, Ltd., in 1947 as assistant to the secretary and was appointed assistant secretary in 1954. In 1956 he became a director of A.E.I. Estates, Ltd., and was also appointed secretary to the Hotpoint Electric Appliance Co., Ltd.

Mr. Isdell-Carpenter joined the company in July, 1957, and became sales director in January, 1958.

Mr. R. Berry, chairman and managing director of Berry's Electric, Ltd., has just left on a round-the-world tour by sea and air. He will be holding trade shows in Australia, complete with display material shipped specially from this country, and will return via New Zealand and the United States. He expects to be back in England on 18th November.

Mr. G. Henderson, A.H-W.C., A.M.I.E.E., sales director of Bruce Peebles & Co., Ltd., retired on 30th September from full-time executive duties but retains his seat on the board. He joined the company as a trade apprentice in 1903 and after a distinguished career at Heriot-Watt College served in the Design Department. Later he managed the Rectifier Department and during the last war was seconded to the Ministry of Labour. After the war he was appointed London office manager. In 1954 he became general sales manager and in 1957 sales director. Mr. Henderson is a past-president of the Association of Mining Electrical and Mechanical Engineers and has represented the Association on the National Advisory Committee on Mining Education. He has also served on the Advisory Committee of Mining Education under the auspices of the City and Guilds of London Institute.

Mr. D. T. L. Rettie

Mr. B. W. Burnett

Mr. R. Isdell-Carpenter

Mr. C. H. Frankland, M.I.E.E., has retired from the board of British Insulated Callender's Construction Co., Ltd., and **Mr. R. Betley** has been elected as an executive director of the company.

Mr. Frankland, who retired on 30th September, joined the company in 1910 and after service in the 1914-18 war rejoined the company in 1919 and was appointed London district contracts engineer in 1929. From 1942 to 1946 he was manager, power cable contracts, and upon the amalgamation of the B.I. and Callender companies became manager, power and telephone cable contracts, in the B.I.C.C. organisation. He has been a member of the board of B.I.C. Construction Co. since its formation in 1949.

Mr. C. H. Frankland

Mr. R. Betley

Mr. Betley's appointment is effective from 1st September when he took over responsibility for the direction of power cable contracts. He joined Callender's Cable & Construction Co. in 1919 as a contract engineer on telephone and power cable contracts, becoming South of England district engineer in 1945 and power cable contract manager in 1955. Two years later he went to Canada as director and general manager of the newly formed Phillips Electrical Construction Co.

British Insulated Callender's Cables, Ltd., announces that **Mr. F. V. Thompson,** F.C.I.S., A.A.C.C.A., has been appointed director of personnel, and has relinquished his position as secretary of the company. **Mr. J. P. Hourston,** B.Com., C.A., who has been assistant secretary since 1946, has been appointed secretary, and **Mr. G. V. Tew,** who is a solicitor and has been on the legal staff of B.I.C.C. for seven years, is now assistant secretary.

The annual dinner and concert of the Sir Thomas Spencer Chapter, **I.T.T. Quarter Century Club** (Standard Telephones & Cables, Ltd.), was held on Friday last at Dunster House Restaurant, Mincing Lane, London, E.C.4, Mr. J. R. Pheazey, vice-chairman, director and joint general manager of Standard Telephones, who

is president of the Club, presiding over a gathering of nearly 500. The members of the Club consist not only of staff and employees at North Woolwich and Southampton, who have completed 25 years' service or more with the company and are still working, but also pensioners who have retired.

Mr. Pheazey, in a brief speech, read a message from Sir Thomas Spencer, chairman of the company and patron of the Club, who he said would be just landing in Sydney, Australia, from Wellington, New Zealand, expressing his regret that he would be unable to be with them, and also a message of regret from Mr. F. C. Wright (managing director) who was entertaining visitors from New York. Mr. Pheazey said that since the last dinner twenty-two people had become eligible and the membership of the Club was now 648. He referred to his recent visit to the Quarter Century Club in Sydney, Australia (the Hungerford Chapter), which had a membership of sixty-one, where he met a number of people he knew who were formerly at Woolwich or Southgate, and said that they sent their good wishes.

Following the dinner there was an hour's break to enable members to renew old friendships, and the remainder of the evening was given over to an excellent variety concert.

Mr. T. M. Ayres, M.I.E.E., has been re-appointed chairman of the North Eastern Electricity Board.

Mr. J. Dummelow, M.A., A.M.I.E.E., who has been assistant manager of the Publicity Department of the Metropolitan-Vickers Electrical Co., Ltd., since 1957, has now been appointed manager of that Department. He was educated at Marlborough and Clare College, Cambridge. After a college apprenticeship followed by technical publicity work with M-V, he joined the publicity organisation of the General Electric Co., Ltd., in 1929. During the war he served with the Royal Engineers. He rejoined Metropolitan-Vickers in 1946 and became editor of the "M-V Gazette" and Press officer. Mr. Dummelow is a member of the Institute of Public Relations. He is also a Freeman of the City of London, being Upper Warden of the Wax Chandlers Company.

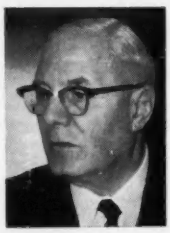
Mr. J. Dummelow

OBITUARY

Mr. W. H. Grinsted.—Mr. William Herbert Grinsted, O.B.E., F.C.G.I., M.I.E.E., a pioneer of telephone engineering in this country, died recently at the age of seventy-four. He was for nearly fifty years a senior technical executive with Siemens Edison Swan, Ltd., and retired in April, 1958, as director of engineering to the company.

Mr. Grinsted joined the National Telephone Co. in 1905 and six years later joined Siemens Bros. and, subsequently, as chief telephone engineer, established the Engineering Section of the telephone department at Woolwich. He played a prominent part in pioneering the development of Siemens' various automatic telephone systems and achieved a worldwide reputation for his work on the application of the theory of probability to telephone traffic problems. In the early 'twenties he introduced junior and senior telephony training courses at Woolwich. He also served on the City and Guilds advisory service for many years. In 1945 he was appointed chief engineer of Siemens' reconstituted Telecommunications Department, became technical director in 1955, and director of engineering in 1957.

Mr. T. E. Goldup.—It is with regret that we have to record the sudden death of Mr. Thomas Edward Goldup, C.B.E., M.I.E.E., a well-known figure in the radio industry, a director of Mullard, Ltd., and a past-President of the Institution of Electrical Engineers, which occurred on 6th October at the age of sixty-five.



The late Mr. T. E. Goldup

Mr. Goldup was an external student of London University and an assistant at the Royal Naval College, Greenwich. From 1914 to 1921 he was on the staff of the Experimental Department of the Signal School and H.M.S. *Vernon*. He joined the Mullard organisation in 1923 and the early days of his industrial career were spent in the Mullard valve factory at Balham where he was responsible for the manufacture of transmitting and receiving valves for the Government. While there he also assisted in the organisation of the valve development laboratories. In 1928 Mr. Goldup was transferred to the head office to set up a Technical Service Department to deal with valve application problems. He was appointed a director of Radio Transmission Equipment, Ltd. (now known as Mullard Equipment, Ltd.), in 1938 and two years later became a director of the Mullard Radio Valve Co., joining the board of Mullard, Ltd., in 1951.

Mr. Goldup was elected chairman of the Radio Communication and Electronic Engineering Association for 1953 and was chairman of the governors of the Ministry of Supply School of Electronics, Malvern. He served on committees of the British Standards Institution and on the Radio Research Board, Department of Scientific and Industrial Research. He was chairman of the Wireless Section of the Institution of Electrical Engineers in 1943-44, became a vice-president of the Institution in 1952, and was President in 1957-58.

The funeral service was held at Christ Church, North Brixton, where Mr. Goldup was honorary organist and choirmaster. The Mullard Company and other radio and electrical concerns were well represented. Sir Willis Jackson (President) and Mr. W. K. Brasher (secretary) attended on behalf of the I.E.E., with Mr. H. T. Young, Dr. P. Dunsheath and Sir Gordon Radley, past-presidents, Messrs. G. S. C. Lucas and C. T. Melling, vice-presidents, and Mr. M. J. L. Pulling, chairman of the Electronics and Communications Section. The interment was at Croydon Cemetery.

In an appreciation of Mr. Goldup published in *The Times*, Sir Willis Jackson, President of the I.E.E., says, "Tom Goldup will be remembered most for his charming personality and his kindliness, and for his devotion to the interests and well-being of young people. Within his own company he created an ideal environment in which his junior colleagues could mature in responsibility, and was always readily at hand to guide them in times of difficulty. He gave a great deal of his private time to serving as a representative of industry on bodies concerned with the progress of technical education and of management training, and loved to do so. Much of this activity was centred upon the Institution of Electrical Engineers, which he served as Committee and Council member for more than twenty years.... Among this multiplicity of activities he dervied great pleasure from his interest in music and found time, continuously since 1933, to act as honorary organist of the Christ Church, North Brixton. His constant aim was to stimulate ideas and initiative in others, not to impose his own, and he derived great satisfaction from the success of those whom he had tried to help. He leaves behind a wealth of gratitude and affection, and an example of service which will be a continuing inspiration to those who were privileged to know him well."

Sir Henry Tizard, G.C.B., A.F.C., F.R.S., the well-known scientist, Rector of the Imperial College of Science from 1929 to 1942, and president of Magdalen College, Oxford, from 1942 to 1946, died on 9th October at the age of seventy-four.

Mr. J. W. Record.—The death occurred at Rhos-on-Sea, Denbighshire, on 9th October of Mr. John Westmorland Record, M.I.E.E., founder of the Record Electrical Co., Ltd., Broadheath, Manchester.

Mr. H. G. Condé, C.M.G., chairman of the Electricity Commission of New South Wales since 1950, died in Sydney on 5th October after a short illness.

INDUSTRIAL NEWS

British Exhibition in New York

British Overseas Fairs, Ltd., is organising, on behalf of the Federation of British Industries, a British Exhibition to run from 10th to 26th June next in the Coliseum Building, New York. The exhibition, which has the support of the Government, the Dollar Exports Council and the British-American Chamber of Commerce in New York, is being staged with the primary purpose of demonstrating Britain's front rank position in scientific and technical research, and both consumer and capital goods will be displayed. There will be an engineering and industrial plant section covering heavy and light engineering products, radio and television, instrumentation, and electronics and automation. Applications for space should be made to British Overseas Fairs, Ltd., 21, Tothill Street, London, S.W.1, from whom full particulars can be obtained.

Electricity Council Scholarship Scheme

Grammar and public schools throughout Great Britain have received details of sixty-one university scholarships being offered by the electricity supply industry. The scholarships are worth £450 a year for three years at Oxford and Cambridge and £400 at other universities. Both boys and girls are eligible to apply. Scholars will be expected to read for degrees in science or engineering, to fulfil certain training requirements, and to return to the industry for two years after taking their degrees.

Heyes & Co.'s New Showroom

A comprehensive range of lighting fittings and signalling and telephone equipment is displayed in the new permanent showroom opened by Heyes & Co., Ltd., at the Water-Heyes Electrical Works, Wigan. Prismatic, "Lacent," "Duolacent" and "Wellglass" lighting fittings are wall-mounted in the corridors and wired for working demonstrations. In the showroom itself, a number of pendant-type and tubular fluorescent fittings are suspended from the ceiling. Many flameproof units, including switches, switch fuses and busbar chambers, are mounted on coloured hardboard panels. There is also a static display of flameproof and non-flameproof units. The type 40 shaft signalling system, with miniature panel, occupies one end of the showroom. Here a telephone dial has been introduced in place of a pull-key for demonstration purposes. There is also a working model of the locomotive haulage signalling system installed in the pit-bottom at Wellesley Colliery.

The new showroom of Heyes & Co., Ltd., Wigan

Educational

An advanced course on "D.C. Power Transmission" is being given at the Heriot-Watt College, Edinburgh, on five successive Saturday mornings, commencing on 24th October. The course is being repeated at Rutherford College of Technology, Newcastle-on-Tyne, commencing on Friday evening, 23rd October, and the Brunel College of Advanced Technology, London, commencing on Wednesday evening, 28th October.

Appliance Control Exhibition

During the past ten days an exhibition of domestic appliances, including cookers, washing machines, dish washers, heaters, etc., has been staged at the London showrooms of Smiths Clock and Watch Division, Great Portland Street, W.1. All the appliances on show have one thing in common—each is fitted with either semi-automatic or automatic control equipment, such as minute timers, control clocks, time switches, etc., marketed by the Appliance Control Branch of Smiths.

Although not a large display (approximately two dozen manufacturers co-operated by loaning products) it serves to show the advance the domestic appliance industry has made in recent years with the advent of automatic controls and, at the same time, the close collaboration of the Appliance Controls Branch and the appliance industry.

Also on view, in prototype form, are modernistic designs and presentations of cooker control panels. The exhibition closes today (Friday) at 5 p.m.

Works Visit

The 100th Sulzer rail traction diesel engine to be built by Vickers-Armstrongs (Engineers), Ltd., for British Railways was completed recently at the Barrow-in-Furness Works, where Sulzer six- and eight-cylinder engines are in production. Officers of the British Transport Commission (British Railways Central Staff) and from Regions of British Railways visited the works on 30th September to inspect this engine and to see current production. The party included Messrs. J. F. Harrison, chief mechanical engineer, and S. B. Warder, chief electrical engineer, B.T.C. (B.R. Central Staff), T. C. B. Miller, chief mechanical and electrical engineer, Eastern Region, W. J. A. Sykes, chief mechanical and electrical engineer, and H. S. Smyth, electrical engineer, Southern Region.

P.O.A. Conference

The Purchasing Officers' Association held its annual conference and "Minibition" at Folkestone from 24th to 26th September. Mr. W. H. McFadzean spoke on "Europe—the Outer Seven and the Six," and there was a discussion on "Commodity Price Stabilisation" between the Hon. J. Grimston, M.P., managing director of Enfield Rolling Mills, Ltd., Mr. F. S. Anderson, C.B., chairman of the International Wheat Council, Mr. B. S. Yamey, B.Com., Reader in Economics, London School of Economics, and Mr. F. S. Lloyd, chief buyer, Crompton Parkinson, Ltd. The judging of the "Minibition" was by Mr. D. M. Forrest, chairman of the Design and Industries Association; Miss R. S. Absalom, buyer for Kent Alloys, Ltd., and chairman of the Association's Mid-Kent Group; and Mr. P. Fellows, head of the Exhibitions Department, Council of Industrial Design. The new president of the Association is Mr. A. H. Thomas, manager of Purchasing, Stores and Raw Materials Control, British Belting & Asbestos, Ltd.

Glasgow Modern Homes Exhibition

A wide variety of domestic electrical appliances is on show at the Modern Homes Exhibition, promoted by Glasgow Corporation, which is being held at the Kelvin Hall, Glasgow (7th to 24th October). A large area of the hall is taken up by the Electricity Pavilion, in which there are twenty-three stands.

The exhibitors include the South of Scotland Electricity Board, the G.E.C.,

English Electric Co., Ltd., Simplex Electric Co., Ltd., Belling & Co., Ltd., Revo Electric Co., Ltd., Tricity Cookers, Ltd., Falco Electrical Appliances, Ltd., National Pressure Cooker (Eng.), Ltd., Engelhard Industries, Ltd. (Hanovia Lamps Division), Dimplex, Ltd., Heatrae, Ltd., Thermalay, Ltd., Hoover, Ltd., Burco, Ltd., Acme Domestic Equipment, Ltd., Radiation, Ltd. (Electrical Division), Kenwood Electric, Ltd., Philips Electrical, Ltd., and a number of local electrical firms.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £231 0s 0d
Fire Refined 99·70%	ton £230 0s 0d
Fire Refined 99·50%	ton £229 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £261 15s 0d
H.C. wire and strip..	ton £285 5s 0d
LEAD, English ..	ton £70 10s 0d
Foreign	ton £69 0s 0d
MERCURY	flask £71 10s 0d
TIN, block (English) ..	ton £794 10s 0d
ZINC, G.O.B. Foreign	ton £88 12s 6d
BRASS Tubes (solid drawn)	lb 1s 10½d
Wire	lb 2s 8d
PHOSPHOR BRONZE Wire	lb 4s 0½d
PLATINUM	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 35½d—35½d

New Cable Ship

Cable & Wireless, Ltd., has accepted a tender by Cammell Laird & Co. (Shipbuilders & Engineers), Ltd., Birkenhead, for the building of a new cable repair ship which will cost over £1,000,000. It is expected that the keel of the vessel will be laid early in February next year and that she will come into service in the middle of February, 1961. The ship will be diesel-electric propelled, with a gross tonnage of approximately 4,000 tons, and capable of handling repairs to telegraph cable and to coaxial cable and rigid repeaters of the type to be used in the Anglo-Canadian telephone cable to be laid in 1961, and other sections of the proposed round-the-world Commonwealth telephone cable. She will have a maximum speed of 15 knots, a sea endurance of seven weeks and will be air-conditioned to enable her to work in tropical waters, as well as more temperate climates. The overall length will be approximately 367ft and breadth about 47½ft and the cable capacity 21,000 cu ft, or 420 miles of deep-sea cable.

Cast Iron as an Engineering Material

The British Cast Iron Research Association, jointly with the Metallurgy Department of the Royal College of Science and Technology, Glasgow, has organised a series of lectures to be given at the College from October to December next. The course, under the title of "Cast Iron as an Engineering Material," is primarily for the engineer and designer. Enrolment forms and particulars can be obtained from the secretary, the Royal College of Science and Technology, Glasgow, C.1. The fee for the course of fourteen lectures is £3 3s.

Malayan Microwave Trunk Network

Malaya's first trunk telephone network using microwaves was officially inaugurated on 26th September. The system has been planned, manufactured and installed by Standard Telephones & Cables, Ltd. The new microwave route forms the backbone of the trunk telephone system in Southern Malaya and connects Kuala Lumpur and Singapore with other centres of population. The main route uses equipment working in the 4,000 Mc/s band with a capacity of 600 telephone circuits while the spurs to Johore Bahru and Seremban employ 7,400 Mc/s equipment with a capacity of 240 telephone circuits. The sites for the terminal stations have been chosen so that only short lengths of cables are required to connect the radio equipment with the multiplex channelling equipment and the exchanges.

Decoration Lighting Sets

The A.E.I. Lamp & Lighting Co., Ltd., has added two new Mazda decoration sets for Christmas lighting to the existing range of five. The cone-shaped "Jack Frost Fairylites" are boxed in sets of 12 lamps with spare bulb, and the frosty finish employed gives an unusually colourful appearance. The price is 22s 6d and a spare lamp is available at 1s 3d. The "Firefly Fairylites" are obtainable in sets of 20 lamps—available either in plain or de-luxe (which adds the attraction of brightly coloured skirts to the bulbs)—or 40 lamps in the de-luxe range only. The name aptly describes the brilliant jewel effect of colour produced by these very small bulbs.

Crompton Parkinson "Continental" decoration lighting set

Mazda "Jack Frost Fairylite" decoration lighting set

Each lamp is also fitted with a "cut-out" which maintains the circuit if an individual filament blows. Prices are 20 lamp plain, 25s; 20 lamp de-luxe, 29s; 40 lamp de-luxe, 49s 6d. A spare bulb for the 6 V (40 lamp set) or 12 V (20 lamp set) is available at 10d. All prices are inclusive of purchase tax.

A new festive decoration set comprising twenty permanent contact lamps with coloured translucent petal surrounds has been produced by Crompton Parkinson, Ltd. Attractively boxed, and priced at 25s, the "Continental" set lends itself to decorative arrangements on Christmas trees, for shop window and display festooning, and all other festive season applications. The use of line construction, which means that the last lamp in the set can be at the full 13ft 6in of flex length, provides this flexibility of application.

Another feature is that if a bulb fails the permanent contact cuts out the defective lamp filament, but maintains the electrical circuit. Printed instructions for the replacement of bulbs are given, accompanied by illustrations, on the back of the pack, which is in four colours with a festive motif.

Welding Prospectus

A new prospectus of the School of Welding Technology is available from the Institute of Welding, 54, Princes Gate, London, S.W.7. It gives details and syllabuses of courses being organised from November to March next on a wide variety of welding topics.

Telephone Equipment Publications

Two booklets dealing with their telephone equipment have recently been published by the Telephone Manufacturing Co., Ltd., Hollingsworth Works, Martell Road, London, S.E.21. The carrier telephone terminal equipment, type C16A, which has been designed to increase the telephone traffic carrying capacity of a bearer circuit by providing 16

circuits in the bandwidth normally occupied by 12, is described in booklet No. F3602. The first systems of this type have been supplied to the British Post Office for use on the transatlantic telephone cable. The second booklet, No. F3599, describes the type R40C 40-circuit carrier telephone terminal equipment for use over radio bearers. The system is complementary to the medium distance carrier telephone equipment currently supplied to the British Post Office for use on cables.

Train Lighting

Deliveries have now begun of four-coach diesel passenger trains for service on the St. Pancras-Bedford line. In all, 120 coaches of the non-corridor type are being built at the British Railways workshops in Derby for this service. One novelty which is certain to appeal to passengers is the use of fluorescent lighting in the new coaches. This is not the first time that fluorescent lamps have been used in trains, but this type of lighting is notable because it makes use of a new and cheaper method of converting the 24 V d.c. supply in the train to a.c. Hitherto, the conversion has been performed by a 24 V d.c. motor driving an alternator at a frequency of 400 c/s, but the development of the transistor has made it possible to do the job with apparatus which can be housed in the same box as the lamp's normal control equipment. These individual combined transistor invertor and ballast units at each lighting fitting allow the use of 24 V cable throughout the wiring system. A further advantage is that the transistor invertor has no moving parts and consequently needs virtually no maintenance. The units, supplied by the A.E.I. Lamp & Lighting Co., Ltd., consist of two transistors, a transformer with three windings (primary, feedback, and secondary), and a starting capacitor and resistor, to control the value of the feedback current. Each transistor cuts out in turn, reversing the polarity of the supply, to give an output to the lamp from the high-reactance transformer at 250 V, 1,250 c/s. One 4ft 40 W lamp or two 2ft 20 W lamps, in series, can be run from the circuit.

A.E.I. combined transistor invertor and ballast unit for train lighting

Lamp Publicity

Ekco-Ensign Electric, Ltd., has available new catalogues and leaflets for its complete range of lighting equipment, and a country-wide mailing campaign has been commenced and will be continued at intervals throughout the season. Two attractive new sales aids have been produced. One is a colourful counter dispenser and the other a showcard to draw attention to the new Ekco " Super Slim " fluorescent fitting.

Ekco-Ensign counter dispenser

Electrostatic Separator Pamphlet

A pamphlet describing and illustrating their type O.H. high energy electrostatic separator, publication No. 7204, has recently been issued by the Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4; it supersedes publication No. 7202 which is now out of print. The general principles of this type of separation are outlined and both the standard and laboratory models described, with photomicrographs giving an indication of the separation efficiency obtained.

Change of Name

Aluminium Union, Ltd., has changed its name to Alcan (U.K.), Ltd. The company has for many years been the United Kingdom distributing company for the aluminium ingot and magnesium, bauxite and chemicals produced by its associated companies in Aluminium, Ltd., of Canada.

Trade Announcements

Dowding & Mills, Ltd., have recently rebuilt the works at Bordesley, Birmingham, 12, and they have now partly rebuilt the offices, an interesting decorative feature of which is the plate glass of the entrance hall which is etched with old and new electrical symbols. These etchings have been carried out with various oxides so that they appear in different attractive colours. At the back of the reception desk a photo mural adds a sense of space and gives a vista effect. Pictures on the wall, together with three in his own office, have been executed by the managing director.

It is announced that **de Havilland Propellers, Ltd.,** has formed a new group to apply its experience in system engineering to the development of equipment for the automatic control of industrial processes and manufacture of all kinds. The new group will be at Hatfield in its own premises adjacent to the Propeller Co.'s head office.

Mr. J. T. Grimshaw, who has represented **Hirst, Ibbetson & Taylor, Ltd.,** for many years in Lancashire and Cheshire, retired on 30th September. Following his retirement the company has made various changes in its representatives' territories. Mr. A. Heywood has joined the company to take over the Altrincham, Sale, Warrington, Wigan and Chorley areas; Mr. G. Morris will take over Bury and Heywood; and Mr. G. M. Ovens will take over Rochdale, in addition to their existing territories.

F. H. Bourner & Co. (Engineers), Ltd., announces the formation of a new company, **F. H. Bourner (Fixings), Ltd.,** Manor Royal, Crawley, Sussex, which will handle all the development and research together with the sales and service of the Tool Division of the Bourner organisation.

W. T. Henley's Telegraph Works Co., Ltd., announces that, as from 1st October, it has entered into an arrangement with Voltas, Ltd., which will act as distributor for Henley products in India. Henley's branch offices in Calcutta, Bombay and New Delhi will cease to function except for the purpose of completing contracts and orders outstanding as at that date and for the settlement of outstanding financial matters.

Mr. B. Williams has been appointed resident technical sales representative at the Bristol office of **Crofts (Engineers), Ltd.** He takes up his new duties on 2nd November and will represent the company in Hampshire, Dorset, Wiltshire, Somerset, Cornwall and Devon.

Elga Products, Ltd., has formed a separate department to deal with problems concerning the provision of intrinsic water for semiconductor washing.

Design Centre

The Design Centre, 78, Haymarket, London, S.W.1, will be open until 10 p.m. on Thursday evenings from 12th November until 28th January. Late opening until 7 p.m. on Wednesdays will continue as before.

Change of Address

The Midland regional office of the Board of Trade has moved to Somerset House, Temple Street, Birmingham, 2 (telephone: Birmingham Midland 8221). The Midland Regional Board for Industry has also moved to this address.

ELECTRICAL EQUIPMENT SURVEYS

AS our regular readers will be aware, information with regard to the more widely used items of domestic electrical equipment is published at monthly intervals in the *Electrical Review*, the data being given in tabular form. These surveys, in the style as illustrated below, have been a regular feature of this journal for the past five years and provide an " at-a-glance " guide to current models on the market. Each includes, so far as is possible, a complete list of manufacturers or distributors of the appliances under review, together with such essential details as the size, dimensions, finish, price, purchase tax, etc., as well as illustrations of the more recent models. In addition to the subjects depicted in the montage below, other items such as electric blankets, food mixers, immersion heaters, dry shavers, toasters, convector heaters, etc., are revised and brought up to date annually.

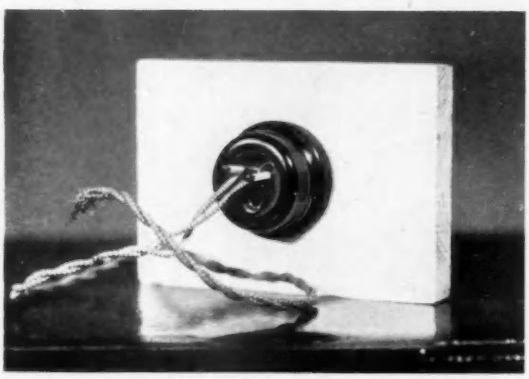
Electrical Safety in the Home

Domestic electrical accidents are very few. In 1948 the number of people electrocuted in the home was 49 and despite the vast increase in the number of consumers the figure for 1958 was still only 79. This is a very small proportion of the total of fatal accidents in the home—7,000 annually. Nevertheless everything possible must be done to reduce even this small number and the author deals with some common practices which should be avoided and recommends methods of ensuring complete safety

By H. W. Swann, O.B.E., D.F.H., M.I.E.E.

Lead sheathed aerial cable to garage supported from steel wire by leather hangers

Above: Radiator perched on soap tray. Below: Wires pegged into a socket by matches



FIRST and foremost the electrical industry tries to look after its customers and consumers, both directly and indirectly, especially those who know nothing about electricity beyond pressing a switch when they want something. The Institution of Electrical Engineers has drawn up a code of safety rules and the newly-constituted National Inspection Council, with its staff of installation inspectors, assists contractors in their observance when wiring houses. The Electricity Boards also have their own inspectors and the Electrical Development Association has joined with the British Standards Institution to form a laboratory organisation at Leatherhead, where various types of appliances intended mainly for domestic use can be tested. In addition to this the Electricity Boards have testing and approval departments and the combined result of all these safety measures is reflected in the accident statistics which plainly show that the majority of the accidents which do occur are caused, not by wiring installations or badly-made electrical appliances, but by some unwise action on the part of a member of the household. Father wants a light in the garage or garden shed and rigs a flexible lead from the kitchen, along the garden fence, to a lampholder hung on a nail. The schoolboy of the family, who has perhaps been taught quite a lot about electricity and magnetism in class, makes a connection for a home-made gadget by wedging two wire ends into the wall socket with matchsticks. Upstairs, where the electrically-heated water tank is so well lagged that the airing cupboard does little to alleviate a chilly bathroom, sister takes an elderly radiator from mother's bedroom and perches it on a soap tray so that she can enjoy the genial heat whilst bathing. Mother, noticing that the flat-iron connector does not seem to push on properly, tries to adjust a bent contact with a pair of scissors.

The most misleading thing about these electrical adventures is that they nearly always work—father gets a light and the bathroom gets warm—and so they become commonplace. It is difficult for a person without electrical knowledge and experience to realise that the multiplicity of electrical appliances now used in the home may be quite safe to touch in the sitting-room and yet cause a fatal accident when moved to a bathroom or garden shed.

The heating element of an electric fire may sag as it ages and touch the metal casing. The safeguard against this is earthing but, if the earth connection also has aged, and perhaps broken, the electric fire goes on working and can be handled by anyone standing on a carpet or dry wood floor, although it is just as "live" as a naked overhead electricity distribution line. Just as birds can perch with impunity on the live line, so the family can

touch the defective radiator until one day it happens to be taken to the bathroom where it is handled by somebody immersed in water who gets a fatal shock.

It is true to say that under household conditions most electrical appliances can go on working undetected even though they have become dangerous. Speaking generally, most people wait until any mechanical or electrical appliance stops working before they trouble much about its condition. A woman may know when to have her wardrobe renovated, or the carpet cleaned, but so long as her radiators, washers and flat irons function she is unlikely to think it necessary to spend money on them, however old they may be, unless they really look worn out in otherwise trim surroundings.

Let us look now at the casualty list for 1958 to learn more about the things which caused 79 people to lose their lives in that year. It is recorded that twelve accidents occurred in bathrooms, eight of which were caused by electric heaters, radiators and fires. The bathroom risk is so well known that the Institution safety rules say, in effect, that wall sockets for portable apparatus may not be fixed in bathrooms. This rule is sound enough, but people who know nothing of it, but only that they want warmth, or a hair dryer, or a radio set in the bathroom, achieve it either by way of a long flex from the nearest outside socket, or by plugging an adaptor into the lampholder. The latter does not provide for safety earthing and the long extension flexes are often only twin conductors even where the wall sockets provide for a third or earthing conductor.

Radiators and other things taken into a bathroom are frequently perched insecurely on ledges, shelves and sills from which they fall into the bath water. The casualty list also contains cases of reading lamps, electric irons, and even a radio set, falling into the water when men, women or children were bathing, with fatal results.

Plugs, sockets or connectors for electric kettles and flat irons caused five fatalities (six in 1957). Many people like to pull the connector off when the kettle boils so that it is not cluttered up by flex when pouring. Every time they do this without switching off, little arcs occur at the connector contacts which burn and roughen them so that the connectors become difficult to push on and, if forced, may bend a contact. The outside of a connector body may carry the earthing strip so that, if the connector is grasped in one hand whilst a pair of scissors is held in the other to straighten the contact, a severe shock through the chest from hand to hand is likely. Some few years back seven women were killed in this way in six months.

Handling radiator whilst bathing

Another cause of accident is worn and twisted flex which was responsible for ten deaths. It is more difficult to understand how people will tolerate damaged and abraded flex when the copper conductors can be seen at the bare places but, as in cases of broken or missing switch covers, the live places do not hurt anyone who is insulated and the accident happens when the environment changes as, for instance, if a damaged flex is used on a damp lawn to connect an electric grass cutter.

The list shows that vacuum cleaners and electric wash boilers accounted for three fatalities each but, here again, lack of maintenance or misuse was responsible rather than any inherent defects in the appliances.

This woman is "repairing" an iron connector with the flexible lead plugged in

(Photo by courtesy of Macdonald & Co. (Publishers) Ltd.)

The Need for Education

Enough has been said to show that, if the gradual upward trend of accidents is to be arrested, some way must be found of creating a reasonable awareness of the risk, an appreciation of the need for service maintenance, and the electrical difference between a bath and a bed, a sitting room and a garage, an experienced electrician and a bright young member of another profession. The heart of the matter is really the need for users of electrical equipment to be better informed. The electrical industry is fully aware of this and is far from regarding domestic accidents as so few as to be hardly worth bothering about, and electrical accidents, which are always headline news in local newspapers, are very bad publicity. The educational work of the Electrical Development Association, the Electrical Association for Women and others who address their message largely to the general public is of great value but it encounters certain difficulties. One of these is the present-day cost of electrical work which, like house painting, plumbing and other services, falls the more heavily on the householder because he cannot pass it on. It is primarily out of this that the "Do it yourself" movement has grown, especially amongst the many present-day consumers who are of the artisan or technician class. These people often know how to

make electrical things work, but not always how to make them safe under all conditions and places of use.

There are also the week-end electricians who work a five-day week for some big organisation. They can often undercut the prices quoted by an approved electrical contractor who is prepared to observe the Institution Regulations and whose work is inspected by the National Council's staff. These week-enders can make things work just as well as if done by a professional and the customer, who judges by results, is unlikely to go into questions of relative quality, workmanship and safety, about which he probably knows nothing.

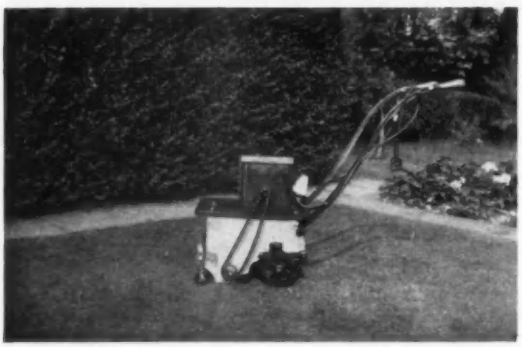
For many years the electrical industry has advised customers and consumers to have their electrical work done by a " competent person." This was, and is, most excellent advice, but it has not always been easy for a non-technical householder, without any knowledge of the electrical background, to recognise a competent person, and it is unfortunate that, although voluntary registration of contractors now makes this easier, the question of cost tends to tempt the customer towards the very handy man or the " Do it yourself " service.

It is worth saying at this point that in establishments coming under the Factories Act all electrical work is done by electrical craftsmen, both because of trade union restrictions and because of the requirements of the Statutory Regulations as to competence. In 1958 there were thirty-eight officially reported and investigated electrical fatalities in factories as compared with seventy-nine in the home.

Regular Inspection Desirable

When the householder has got his new electrical installation and labour-saving appliances all complete and working he may feel that the outlook is bright—as indeed it is if the various things get reasonable care and attention. This, however, raises questions of regular overhaul, or servicing, such as is often thought necessary for motor vehicles and provided for some makes of electric refrigerators, television sets, vacuum cleaners and electric washers. If, however, a householder asked an electrical contractor, or an Electricity Board, to undertake this kind of periodic service for the whole of his installation and electrical equipment he might not meet with a ready and knowledgeable response accompanied by a schedule of work, tests and a scale of regular charges based on years of experience. Thus, as very few householders are likely to take the initiative, the position in the house seems likely to remain unchanged and the need for attention will, as usual, not be apparent until something goes wrong.

In this home-made electric drive the motor stand is insulated from the frame but this desirable isolation is bridged by the chain. The latter is also unguarded



This contrasts sharply with the position in many modern factories where large technical staffs are retained to prevent breakdowns, the essential difference, of course, being that whilst industrial stoppages are costly, a domestic stoppage is not a matter of much moment although perhaps it may involve danger.

The alternative to periodic contractual maintenance by a professional seems to lie in the direction of helping the householder and the housewife to help themselves and the National Inspection Council* may be able to offer advice in this direction as its scope develops. A good many people customarily undertake the easier kind of electrical repairs and, as we go further into the electrical age, the knowledge which derives from constant association and experience is bound to be acquired to an increasing extent, with or without assistance, especially by the growing generation.

The housewife has learned to drive a motor car which, statistically, is far more dangerous than, say, re-wiring a pendant fitting, and again it is more likely statistically that she will fall off the steps than that she will sustain any electrical injury from ceiling rose, flexible, or lampholder. Even so it is better if she knows how to do the job and possesses a few tools.

It is beyond the scope of this article to say much about fires caused by electricity, which amount to about 18 per cent (between 7,000 and 8,000 cases) of those from all causes. Domestic premises make their contribution and fires are caused by installation breakdowns as well as by various appliances. Most of the troubles start as failures of insulation which should be cleared by the protective fuses and circuit-breakers if they are properly designed and maintained in good working order. The fires represent the cases where, for some reason, the automatic protection fails to prevent danger and as time passes, and domestic utilisation continues to increase, more attention will be necessary to both the design and efficiency of the form of protection adopted.

*The National Inspection Council for Electrical Installation Contracting operates a Roll of Approved Electrical Installation Contractors and will give inquirers the names of approved local firms and individuals. Its address is Aldine House, 10-13, Bedford Street, London, W.C.2 (Covent Garden 1163/4).

Broadcasting Equipment Exhibition

At an exhibition held in London concurrently with the European Broadcasting Union Technical Committee's meeting, three firms combined to display a variety of equipment associated with sound and television broadcasting. The principal exhibit by Marconi's Wireless Telegraph Co., Ltd., was the Mark IV image orthicon television camera, which can be employed for either studio or outside broadcast work and is suitable for use with either 3 or 4½in image orthicon pick-up tubes. The camera contains only 12 valves and the circuits are carried on printed sub-assemblies plugged into the main frame, giving easy access for maintenance. A closed circuit television system was also shown incorporating the type 4339A camera and the type 4340A camera control unit. The camera, with a field lens, is mounted on a turntable to receive images from slide or film projectors at one of four indexed positions. The type BD879 monitor unit is normally supplied with this system, but alternative versions are available.

Marconi Instruments, Ltd., exhibited their type TF1277 television measuring oscilloscope, the types TF867 and TF867/2 signal generators and a carrier deviation meter which has a frequency range of 4-1,024 Mc/s. A representative selection of broadcast transmitter valves and TV camera tubes was shown by the English Electric Valve Co., Ltd., including a high voltage rectifier having a peak inverse voltage of 40 kV and an anode dissipation of 130 W.

The Making of Professional Engineers

INAUGURAL ADDRESS OF NEW I.E.E. PRESIDENT

IN his presidential address at the first London meeting of the 1959-60 session of the Institution of Electrical Engineers last week, Sir Willis Jackson chose for his theme "The Making of Professional Engineers." He said that the high standard of living which we enjoyed and were striving to maintain and improve, and the establishment of a defensive strength which we hoped we should never have need to attempt to demonstrate, were dependent upon our export trade. In this we were engaged in a technological battle with countries which could draw on richer national resources and could bring larger numbers of trained men to bear on definite scientific and technical objectives. It was a battle in which national prestige was now linked with priority of scientific and technical achievements, and where what was achieved, or was said to have been achieved, in one part of the world—or well outside it—was reported everywhere within a few hours.

Sir Willis Jackson

Our scientists and technologists had become not only the guardians and guarantors of our national economy but also the agents of a new diplomacy in which more than an expanding export trade was at stake. They had a direct part to play as teachers or advisers in the industrialisation of the under-developed countries and must not only carry conviction as experts in their particular scientific and technical specialities, but also gain respect as ambassadors of broad vision, sound judgment and unquestionable integrity. The demands on the young men who were entering this complex and diversified activity were growing in scope and severity which demanded a more prolonged preparation in education and training.

The treatment of the principles of physical and engineering sciences on which undergraduate and similar courses must be largely concentrated would need to be supplemented increasingly at appropriate later stages of experience. This would demand the participation as teachers of men whose primary activity was in the practice of engineering and a much greater measure of collaboration between the universities, technical colleges and industry than existed at present. Our limited progress in this connection, and other weaknesses of our educational system, reflected our continuing tendency to regard the schools, universities, technical colleges and industry as separate compartments, and not as interwoven and interdependent elements, in a continuous educational process.

Teaching and Practice

The president said that it was quite unrealistic to suppose that the technological training at its highest level could be carried out wholly, or largely, by men who occupied full-time teaching posts unless these men returned to industry or a similar environment at appropriate intervals. In his opinion the raising of technological teaching in this country to the level required demanded a much greater mobility of staff between educational institutions on the one hand and industry or Government establishments on the other, than had yet been achieved and, in supplementation, that carefully selected men should be fully recognised men of both, as was already the case in the medical field.

A good start would be for the research establishments of the Department of Scientific and Industrial Research, and some of the research associations, to be accepted by the appropriate universities as recognised institutions in this sense. The separation of the D.S.I.R. establishments from the domain of technological teaching and the lack of a recognised link between them and the universities in respect of scientific and technological research, were national handicaps of great seriousness which should be removed as quickly as possible.

The universities had experienced considerable difficulties in recent years in obtaining as full-time members of their engineering departments a sufficient number of men who were leaders, or potential leaders, of thought in their subject and also keen and capable of teaching it. The difficulty arose basically from the fact that, in deciding to take up the study of engineering, a young man was motivated, generally speaking, by the desire to practice, not to teach it. His entry into teaching work usually involved, therefore, a withdrawal from practice in circumstances where, at present, the practice afforded considerable attractions. For men with engineering in their blood, the practice of it, particularly at times of rapid technological change and industrial expansion, was a highly stimulating experience and one which afforded considerable scope for the exercise of initiative and the carrying of responsibility. The problem was how to marry this situation to the need, in the larger technical colleges as well as in the universities, for more forward-looking teachers of technology.

Shortage of Training Facilities

Sir Willis then passed on to deal with the training of professional engineers and said that the shortage of industrial training facilities had become the Achilles heel of our national plans for the further development of technological and technical education. It seemed that this problem could be resolved only if the smaller and more specialised firms would collaborate in the organisation of group schemes in which their limited individual resources were properly co-ordinated. A good example of such a scheme in the training of graduates and student apprentices was the Scottish Electrical Training Scheme embracing five electrical manufacturing concerns and two Electricity Boards. Unfortunately, there was not much evidence of initiative elsewhere to follow this example. It was a matter of speculation, therefore, as to how an extension of it was to be achieved and, regrettably, of doubt as to whether it could ever be achieved on a sufficient scale without some form of financial help from the Government.

In discussing the utilisation of professional engineers the President wondered whether we were using the highly

qualified men we already possessed to the best national advantage and, if not, what steps could be taken to correct the situation. He said that some corporate members of the Institution might be performing duties which, with appropriate replanning and with the fuller utilisation of computing and other new techniques, might well be undertaken by men or women of lower academic qualifications than were required for corporate membership. This process of devolution was a continuous one in progressive industry, and it was characteristic that highly qualified people so relieved moved into new fields of further creative effort with similar later consequences. It was a process which increased rather than decreased the need for highly qualified people, but it demanded for its progression the availability of people, themselves well educated and trained to a different level, upon whom the work could be devolved. In stressing our shortage of scientists and technologists we gave inadequate recognition to the importance of the supporting contribution and too little attention to the educational needs in the rapidly changing situation of the much larger body of our technicians and craftsmen.

There was a further aspect of our utilisation of scientific and engineering manpower about which the President was becoming increasingly concerned. It arose from the high degree of sub-division which characterised our industrial structure. This sub-division produced among the larger organisations a considerable multiplication of research, development and design effort directed to the same, or substantially the same, technical objectives, and the possibility that no one of these concerns had the resources either of manpower or finances to launch a really major attack on a new field. Among the small firms it meant, all too often, not only an absence of research and development effort within themselves, but also an inability to take advantage of the results of work of this kind being done in the research associations on their behalf. In view of this it behoved the senior members of professions like their own to do all they could to ensure in their respective fields that what strength they had was not misapplied in unnecessary duplication, to the possible frustration of the young men who were joining them in their professional enterprises, and the detriment of the national well-being.

T.I. RESEARCH LABORATORIES

THE new laboratory block of the Tube Invesments Research and Development Division at Hinxton Hall, near Cambridge, is now being used for a number of research projects. The laboratory was designed mainly for work in the solid state physics field but provision has been made for other specialist facilities. The total area is 32,500 sq ft on three floors and includes a lecture theatre. The laboratory, conference rooms, administration and technical service accommodation remain in the old Hall, where research work was started in 1954.

Among the research work being carried out is the electron microscopy of thin metal films, and welding studies, including work on resistance welding which has shown that the flow of electricity across the boundary between two metals placed in contact does not follow the normal laws of electrical conduction in bulk materials. Work is also being carried out on ultrasonic welding in which two aluminium sheets held together can be joined by ultrasonic vibrations. Investigations are being made into corrosion and the application of high energy irradiation. Among the new instruments at the laboratory are an X-ray scanning micro-analyser developed specifically for work on metallurgical problems, a tube eccentricity meter in which wall thickness variations are assessed by their electrical screening effect, and a microammeter operating on a variation of this principle which can be used for recording small displacements in length measurements, e.g., creep testing, as a sensitive position indicator or as a limit switch.

Among the companies in the T.I. group which will benefit from work at the new laboratory are those in the Electrical Division, including Mersey Cable Works, Ltd., the Metallic Seamless Tube Co., Ltd., the Power Centre Co., Ltd., and the Simplex Electric Co., Ltd.

I.E.E. Benevolent Fund

THE 1958-59 report of the Court of Governors of the I.E.E. Incorporated Benevolent Fund shows that at 30th June last the capital of the general fund stood at £157,283 (against £149,224 at 30th June, 1958) and that of "The Chesters" Trust at £18,513 (against £18,264). The income for the year from all sources for the fund and "The Chesters" Trust amounted to £19,680 (£18,876), of which £16,110 (£15,475) came from subscriptions and donations.

The amounts raised in local centres by social functions, special collections, etc., have continued to give material assistance to the general and homes funds. The income from subscriptions shows a continued increase and this is still largely attributable to the appeal circulated by the President with the December, 1957, issue of the *Journal*, and also the 1958 appeal. However, only 30 per cent of members subscribe to the fund and the Court urge most strongly that other members should follow their example.

The present cost of grants plus management and maintenance charges is £15,081, and although this is a little less than the sum received from subscriptions and donations, every effort must be made to continue to increase the income annually, as only by this means can the Court of Governors increase the assistance given to beneficiaries. The total number of grants made to beneficiaries was 142 as against 132 the previous year, and to dependants 122 against 112. These figures were 116 and 95 for the year ended 30th June, 1957. As before, some grants have been discontinued because of death or improved circumstances and the total amount of the grants made during the year under review was £10,038; the average amount distributed per beneficiary was approximately £73. The Fund now has four beneficiaries resident in the Trust homes.

Clean Air Conference

REPRESENTATIVES from over 30 countries will be attending the world conference on air pollution organised by the National Society for Clean Air to celebrate its diamond jubilee, which is to take place in London from 20th to 23rd October under the patronage of H.R.H. the Duke of Edinburgh. The conference, at the Seymour Hall, London, W.1, will be opened by the Lord Mayor, Sir Harold Gillett, and subsequent sessions will be opened by the Ministers of Housing and Local Government, Power, and Health. Another session is to be opened by the chairman of the Clean Air Council for Scotland, Sir David Anderson.

Some 75 written papers have been sent in for discussion on such subjects as national air pollution problems, legislation and its administration, the technical problems of preventing pollution, investigation, measurement, medical and other research, with papers on international co-operation in this work. The kinds of air pollution to be discussed include smoke, grit and dust, sulphur and other noxious fumes, and the fumes and smoke from road vehicles.

Associated with the conference will be a Clean Air Exhibition, also at Seymour Hall, which will be open free of charge to the public from 9 a.m. to 6 p.m. on Tuesday, Wednesday and Thursday, 20th to 22nd October.

The Society is publishing a commemorative handbook, "Sixty Years for Clean Air," price 2s, which gives details of the Society's history, conference information, the programme of papers and details of the stands at the exhibition. The handbook and other information about the conference may be obtained from the Society at Palace Chambers, Bridge Street, London, S.W.1.

GENERATION and DEVELOPMENT

Domestic Appliance Sales

The accompanying return shows the number of new appliances sold by Area Electricity Boards in England and Wales for the month of August and for the twelve months ended 31st August, 1959, together with percentage changes over corresponding periods of the previous year. When assessing the figures it must be borne in mind that the sales by Area Boards represent only a part of total sales throughout the country.

	Month ended 31st August		Twelve months ended 31st August	
	Total	Change %	Total	Change %
Cookers ...	26,102	+ 39·1	329,939	+ 44·9
Water Heaters:				
Immersion ...	18,305	+ 30·6	188,671	+ 22·1
Storage ...	4,403	+ 19·3	57,745	+ 28·5
Wash Boilers ...	5,648	− 10·7	72,987	− 8·2
Washing Machines ...	13,494	+ 97·5	161,552	+114·9
Refrigerators ...	17,434	+168·4	156,961	+163·5

Loch Awe Scheme

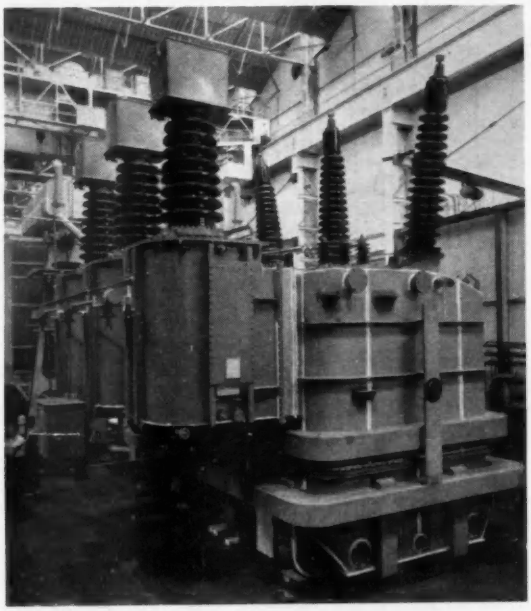
The North of Scotland Hydro-Electric Board has placed the first of the main civil engineering contracts for work on its Loch Awe combined conventional and pumped storage hydro-electric scheme.

George Wimpey & Co., Ltd., are to carry out the main works of the Inverawe section, including a concrete lined tunnel 23ft 6in in diameter and about three miles in length, a surge shaft 80ft in diameter and about 110ft deep, and the excavation of the power station site. The tunnel will be mainly in granite and is to run from a barrage at the mouth of Loch Awe through Ben Cruachan to a power station about half a mile upstream from where the River Awe enters Loch Etive. In addition, the company is to build a road to give access to the site of the dam which will be constructed on Ben Cruachan as part of the pumped storage section of the scheme.

A. M. Carmichael, Ltd., have been given the contract for the construction of a road to Loch Nant where a dam will be built to provide the storage reservoir of the Nant section. The total value of these contracts will be just under £2 million. The estimated cost of the whole scheme, when published, was £24·5 million. The civil engineering consultants for the Cruachan and Inverawe sections are Messrs. James Williamson & Partners and for the Nant section Messrs. Babtie, Shaw & Morton, Glasgow.

Large Transformer for Skelton Grange

The highest rated power transformer of its class to be made in Great Britain left the Rugby Works of the British Thomson-Houston Co., Ltd., on 3rd October *en route* for Skelton Grange substation, near Leeds, of the C.E.G.B. Yorkshire Division. The transformer is rated at 180 MVA, 275/132 kV and will be used for the supergrid. It is the first of four of similar rating ordered by the C.E.G.B. from the B.T.H. Co. (whose transformer interests are now integrated with those of Metropolitan-Vickers in the Associated Electrical Industries Transformer Division). One of the remaining three is for Skelton Grange and the other two are for West Melton, near Sheffield. These transformers have been designed for an impulse level of 1,050 kV full wave on the h.v. winding and 550 kV full wave on the l.v. winding. The transformer is constructed with shielded cylindrical layer type h.v. windings. All coils are wound with rectangular stranded cable, giving low stray loss, coupled with great mechanical strength. The cores are constructed of cold reduced grain oriented silicon iron. The on-load tap changing equipment is at the 132 kV line end of the winding and is of the high-speed resistor transition type.



The 180 MVA, 275/132 kV transformer which has been dispatched from the Rugby Works of the B.T.H. Co. for Skelton Grange substation

Bulk Removal of Wet Fly Ash

At Cliff Quay power station, Ipswich, the total amount of fly ash in the lagoons surrounding this station is estimated to be in the neighbourhood of 1 million cu yd, covering an area of some 40 acres. Normally the wet fly ash is extracted from the lagoons by grab, dumped on the banks to dry and later loaded by the grab into tipper vehicles for removal. Recently, however, the Fly Ash Division of Stephenson Clarke, Ltd., of Ipswich, has embarked on the task of shifting the ash in wet slurry form, using waterproofed "U" shaped light alloy tippers built by Bonallack & Sons, Ltd., of Basildon. Five of these vehicles are now shifting over 700 cu yd of wet slurry a day to a point some two miles distant from the lagoons.

OVERSEAS

Supply Extensions in Dominican Republic

The Corporacion Dominicana de Electricidad is shortly to commence work on three extensions to the electricity supply in the Dominican Republic which will cost approximately $1 million. These consist of a 40-mile line from Azua to San Juan de la Maguana, a fifty-mile extension from Pimentel to the Cotui area, and 22 miles of additional cables in the Monte Plata area.

Street Lighting Notes

A new slim fluorescent lantern made of aluminium and "Perspex" has been supplied by the General Electric Co., Ltd., for main road street lighting in **St. Marylebone.** The installation, which is nearing completion, consists of 101 lanterns containing four 80 W "Osram" fluorescent tubes and 24 containing three. These lanterns have been installed in Wigmore, Great Portland and other streets. A new method of constructing the lantern body has been employed and the light is controlled by a refractor optical system specially designed at the G.E.C. Laboratories, Wembley. All gear necessary to operate the tubes is housed in the lantern body. The first units were switched on by the Mayor of St. Marylebone, Lt.-Col. Henry C. S. Thomson, O.B.E., A.C.A, at a brief ceremony in Gloucester Place on 21st July. Mr. S. G. Purkis, O.B.E., borough engineer and surveyor, planned the installation.

Smethwick's plan to improve lighting on Class "B" roads will cost £20,965. Electric lamps are to displace 875 gas lamps.

Sunderland Town Council has received sanction to borrow £66,500 for improved street lighting.

Financial Section

STOCKS and SHARES

NEVER before has the Stock Exchange witnessed scenes of such activity as those which developed in the few days either side of the polling day. A great volume of business has been passing in both directions, with a good deal of profit-taking in progress on the one hand, and on the other the investment of some of the money previously held in suspense by the political uncertainty. The course of share prices seems bound to move erratically until institutional and private investors have gone further towards making up their minds on the level appropriate to the new circumstances.

Extent of the Rise

Changes marked in the accompanying tables cover the few days preceding the Election (when markets were already going great guns) and first reactions to the outcome of it. They can give no more than an approximate idea of progress, since prices are still subject to abrupt movements from hour to hour, but they show clearly enough that even if they have not matched the spectacular performance of steel shares, electrical issues have been marked up on a substantial and comprehensive scale. Advances of about 3s 6d in A.E.I., 5s in English Electric and 6s in G.E.C. could be taken as fairly representative of the experience of high-grade shares in many sections of the industrial market over the Election period. C. A. Parsons and A. Reyrolle recorded net gains of 6s 3d and 4s respectively, while Crompton Parkinson, with the final dividend due before the end of the month, put on 2s 3d.

Further Gains

In the category of consumer goods investments, Hoover took their customary place in the van of the upward movement with a rise of 7s 6d. There were advances of a shilling or more in shares such as Morphy-Richards (in advance of the final dividend declaration), Bulpitts and Berry's Electric. Plessey and Thorn Electrical added 1s 6d and 3s respectively to earlier gains, and there were improvements of half-a-crown upwards in E. K. Cole, Decca and Ever Ready. In the cable group, B.I.C.C. were particularly favoured, while among motor accessory issues Lucas and Chloride Electrical were both advanced by about 3s, and S. Smith rose 1s 9d further. In Tube Investments the gain was as much as 9s 3d, and the advance of 5s 6d in Head Wrightson was also notable. Other gains of up to 2s 6d appeared plentifully down the list. Among the shares known to have an American following, E.M.I. put on 3s 6d and Elliott-Automation 2s 9d.

Yields Now

One of the factors determining the level at which share prices will settle down is certain to be the width of the margin between yields obtainable in the gilt-edged and industrial markets. While the rise of prices in the latter brought yields down with a run, the return from Government stocks was scarcely altered by the fractional improvement

Price Changes in

Company or Board	Nom. Value	Middle price 12th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1959 Highest	1959 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	78½	+½	3	3	3 16 6	80½	77½
Brit. Elec. 1974/77	100	75	+½	3	3	4 0 0	77	74½
Brit. Elec. 1976/79	100	78x.d.		3½	3½	4 9 9	80½	77½
Brit. Elec. 1974/79	100	88½	+½	4½	4½	4 15 3	91	87½
Overseas Electric Supply								
Calcutta Elec.	£1	18/6		6·8†	7†	12 5 0	19/6	16/-
East African Power	£1	20/-		7½	8	8 0 0	22/3	19/3
Nigerian Elec.	£1	14/-		8	8	11 8 6	15/-	13/-
Perak Hydro-Elec.	£1	14/6		12½	10	13 15 9	15/-	12/3
Electrical Shares								
Aberdare Holdings	5/-	17/3	+9d	17½	17½	5 1 6	18/-	15/6
Aerialite	1/-	10/6	+1/-	51½	54	5 2 9	10/6	7/9
Allen, W. H.	£1	52/6	+1/3	11	12	4 11 6	52/6	43/-
Allied Insulators	5/-	21/-	+1/-	—	20‡	4 15 3	21/6	18/9
Anglo-Portuguese Tel.	£1	30/6	+1/6	9	9	6 4 3	30/9	26/6
Aron Elec. Ord.	£1	51/3		15	15	5 17 0	62/6	51/3
Assoc. Elec. Ord.	£1	64/9	+3/6	15	15	4 12 9	65/-	53/9
Automatic Tel. & El.	£1	77/6	+2/6	17	17‡	4 7 9	82/6	71/3
Babcock & Wilcox	£1	52/6	+5/-	13½	13	4 18 9	52/6	45/6
Bakelite	10/-	33/9	+2/6	15	15	4 9 0	34/-	22/-
Baldwin, H. J.	2/-	2/3		20	20	—	3/-	2/3
Berry's Electric	5/-	22/3	+1/6	10	20‡	4 10 0	22/3	7/3
Bowthorpe Holdings	2/-	16/6	+1/3	25	27	3 5 6	16/6	11/9
British Elec. Traction: Def. Ord. "A"	5/-	44/-	+5/-	25	35	3 19 6	45/-	35/6
B.I. Callender's	£1	57/6	+3/6	12½	13½	4 13 9	58/6	44/9
B.I. Callender's 6% Pref.	£1	20/6		6	6	5 17 0	20/6	19/9
British Thermostat	5/-	21/6		30	35	4 1 6*	28/-	18/6
British Vac. Cleaner	5/-	8/-	+3d	10	7½*	4 13 9	8/-	4/6
Brook Motors	10/-	54/-	+2/9	25	24½*	4 9 0	54/3	46/-
Bulgin, A. F.	1/-	11/6	+1/-	45	50	4 7 0	11/6	6/9
Bulpitts	5/-	18/-	+1/3	—	15	4 3 3	18/3	10/-
Burco Dean	5/-	16/9	+6d	22½	16*	4 15 6	16/9	12/3
Cable & Wireless: Ord.	5/-	17/6	+1/3	10	10*	2 17 3	17/6	12/3
4% Loan	100	94½		4	4	4 4 9	95	93
Chloride El. Storage "A"	£1	61/3	+3/9	17½	20‡	4 6 6*	62/6	43/8
Clarke Chapman	£1	55/-	+1/3	27½	13½*	5 0 0	66/3	52/6
Cole, E. K.	5/-	23/-	+2/6	17½	20	4 7 0	23/6	17/3
Contactor Switchgear	5/-	16/-	+1/-	20	14*	4 7 6	16/3	12/-
Cossor, A. C.	5/-	7/9	+3d	Nil	5	3 4 6	9/-	6/3
Crabtree	10/-	33/-	+1/-	20	20	6 1 3	33/3	28/-
Crompton Parkinson	5/-	16/3	+2/3	16	12*	3 13 9	16/9	11/9
Davis & Timmins	5/-	18/6	+6d	18	20	5 8 0	18/6	14/6
De La Rue	10/-	56/3	+7/6	17½	20	3 11 0	56/3	30/3
Decca "A"	10/-	40/-	+3/-	43½	50	5 0 0*	40/3	33/3
Desoutter	5/-	28/6	+1/-	32½	21½*	3 16 0	28/6	19/-
Dewhurst	2/-	8/9	+6d	20	20	4 11 6	8/9	7/3
Dictograph Tel.	2/-	8/3	+3d	20	20	4 17 0	8/3	7/-
Dubilier Condenser	1/-	4/6		20	25	5 11 0	5/-	3/3
Duport	5/-	16/-	+1/9	25	12½*	3 18 3	16/-	10/3
E.M.I.	10/-	56/3	+3/6	15	20*	3 11 0	64/6	48/-
Electrical Apparatus	5/-	16/6	+1/6	12½	14½	4 8 0	16/6	13/-
Electrical Components	5/-	16/9	+9d	12½	15	4 9 6	16/9	10/6
Elec. Construction	£1	34/-	+1/-	8½	9	5 6 0	34/-	27/9
Elliott-Automation	5/-	26/-	+2/9	—	10‡	1 18 6	30/6	16/9
English Electric	£1	48/9	+5/-	14	14	3 16 6*	48/9	37/10
English Electric 3½% Pref.	£1	13/-		3½	3½	5 15 6	12/9	12/3
Ericsson Tel.	5/-	25/-	+2/9	12½	13½	4 5 6	27/3	22/3
Ever Ready	5/-	28/-	+3/-	20	27½‡	2 18 9*	28/-	13/3
Falk Stadelmann	£1	26/-	+1/-	17½	10*‡	7 13 9	32/9	25/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

in quotations. Against the 5 per cent yield shown at present by 2½ per cent Consols, the average from leading industrials is now measured by the indices at little more than 4½ per cent, and the lists show much lower rates than that in the case of many of the most popular issues. Among the leaders in the electrical market, A.E.I., General Electric and B.I.C.C. have been quoted recently to give yields a fraction over the 4½ per cent industrial average. About level with the latter were such shares as Automatic Telephone, Chloride Electrical, Lancashire Dynamo and Vactric.

Electrical Investments

Company or Board	Nom. Value	Middle price 12th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1959 Highest	1959 Lowest
Electrical Shares—continued								
G.E.C.	£1	46/-	+6/-	10	10	4 7 0	46/3	31/3
G.E.C. 6½% Pref.	£1	22/-		6½	6½	5 18 3	22/-	20/3
General Cables	5/-	8/3	+6d	24	15	9 1 9	9/3	7/6
Greenwood & Batley	£1	105/-		20	30	5 14 3	105/-	75/-
Hackbridge Holdings	5/-	18/6	+1/-	20	20	5 8 0	19/-	14/3
Hackbridge & Hewittic	5/-	13/6	+6d	20	20	5 11 0*	13/6	10/6
Head Wrightson	5/-	37/6	+5/6	17½	20*	2 13 3	38/-	24/3
Heatrae	2/-	10/-		20	20	4 0 0	10/-	7/6
Holophane	5/-	18/3	+9d	22½	26	7 2 6	18/9	14/9
Hoover	5/-	87/6	+7/6	50	60	3 8 6	87/6	55/-
I.C.I.	£1	53/3	+6/9	12	8*	3 0 0	54/-	33/-
Intl. Combustion	5/-	38/3	+3/9	25	30‡	3 18 6	38/6	29/9
Intl. Computers & T.	£1	71/3	+6/9	—	8‡	2 5 0	78/9	57/6
Johnson & Phillips	£1	21/6	+1/6	5	5	4 13 0	30/6	20/-
Lancashire Dynamo	£1	45/-	+2/6	11	12½‡	4 3 6*	45/-	31/6
Laurence Scott	5/-	17/3		15	15	3 15 0*	17/3	14/-
Lister, R. A.	£1	43/6	+1/6	10	12½	5 15 0	43/6	32/9
Lucas, J.	£1	57/6	+3/-	7½	10‡	3 9 6	58/6	43/3
Marconi Marine	£1	43/-	+1/-	10	10	4 13 0	48/6	40/-
Marryat & Scott	2/-	10/-	+3d	37½	22½*	4 10 0	10/-	8/6
Mather & Platt	£1	48/-	+2/6	15	10‡*	4 8 9	51/6	41/3
Metal Industries	£1	62/6	+8/-	14	14	4 9 6	62/6	39/9
Midland Elec. Mfg.	£1	46/3		12½	10*	4 6 6	46/3	41/6
Morphy-Richards	4/-	30/-	+1/3	20	20	2 13 3	30/6	18/-
Murex	£1	55/-	+3/-	17½	15	5 9 0	55/-	42/-
Newman Ind.	2/-	3/3		10	10	6 3 0	3/6	2/3
Oldham & Son	1/-	3/3	+3d	17½	17½	5 7 9	3/3	2/6
Parsons, C. A.	£1	56/3	+6/3	7½	8½‡	2 17 9	58/-	45/9
Philips' Lamps	Fl.10	122/6		14	14	2 3 0	130/-	88/-
Plessey	10/-	37/6	+1/6	30	14*‡	3 14 9	37/6	23/6
Pye	5/-	18/-	+1/6	12½	12½	3 9 6	18/-	13/9
Pyrotenax	5/-	41/3	+3/3	—	34	4 2 6	41/6	33/9
Reliance Clifton	5/-	24/-	+2/-	15	15	3 2 6	24/-	17/6
Reyrolle	£1	96/6	+4/-	17½	17½	3 12 6	98/-	85/9
Rheostatic	4/-	10/3		12½	12½	4 17 6	10/9	8/3
Richardsons Westgarth	10/-	12/9	+1/3	8½	8½	6 10 3	15/3	11/6
Simon-Carves	5/-	31/3	+1/9	25	25	4 0 0	32/-	28/6
Smith (England), S.	4/-	19/3	+1/9	20	12½*‡	2 12 0	20/-	11/6
Southern Areas	£1	14/-	+9d	Nil	Nil	Nil	15/-	10/6
Strand Elec.	5/-	12/3	+6d	15	20	8 3 3	12/3	8/6
Sturtevant	5/-	19/-		15†	15†	6 9 0	20/-	17/-
Sun Elec.	5/-	15/9		25	25	3 19 3*	16/9	8/3
Switchgear & Cowans	5/-	13/6	+3d	22½	15*	5 11 0	13/9	10/3
T.C.C.	10/-	50/-		25	25	5 0 0	50/-	38/-
Telephone Mfg.	5/-	7/3	+1/-	10	10	6 18 0	7/3	4/9
Telephone Rentals	5/-	17/6	+9d	12½	12½*	3 11 6	17/6	11/9
Thompson (John)	5/-	20/-		25	25	6 5 0	25/6	20/-
Thorn Elec.	5/-	41/6	+3/-	17½	20	2 8 3	41/6	26/3
Thornycroft	£1	25/-		12½	7½	6 0 0	30/-	20/6
Tube Investments	£1	106/3	+9/3	15	17½	3 5 9	110/-	71/6
Vactric	5/-	45/-	+1/3	25	37½	4 3 3	46/6	26/3
Veritys	5/-	1/6		12½	2½	—	5/-	1/3
Walsall Conduits	4/-	13/3	+9d	22½	22½	3 18 0*	14/2	10/8
Ward & Goldstone	5/-	49/-	+3/6	25	30	3 1 3	50/-	30/6
Watford	2/-	11/9	+1/9	25	25*	4 5 0	11/9	7/6
Westinghouse	£1	52/6	+2/6	10	10	3 16 3	52/6	39/6
West, Allen	5/-	13/3	+6d	12½	11½*	4 7 6	13/3	11/9
Wolf Electric	5/-	9/3	+6d	10	10	5 8 0	9/3	7/9

Below Average

Electrical shares which now show returns of appreciably less than 4 per cent on the basis of the latest dividend rates include English Electric, Hoover, E.M.I., Lucas, Plessey, Pye and Reyrolle. On Ward & Goldstone the return is a fraction over 3 per cent. Below that mark come Ever Ready, C. A. Parsons, Thorn Electrical and Head Wrightson, while on Elliott-Automation the yield has diminished to less than 2 per cent. At the upper ranges of the scale there are still returns of 5 per cent or a little more to be had from, for instance, Decca "A" shares, Aberdare Holdings, Aerialite, Switchgear & Cowans, Oldham, Hackbridge Holdings and Electric Construction.

I.C.T. Finance

The £1 ordinary shares of International Computers and Tabulators (formerly the British Tabulating Machine Co. until the merger with Powers-Samas) have long had the distinction of being among the lowest yielding investments in the industrial market, and after being marked up from 64s 6d to 71s 3d over the Election period, the return on the expected 8 per cent rate of dividend contracted to no more than 2½ per cent. Last July the company raised some £8 million new capital through issues of debenture stock and ordinary shares, both of which are still in partly-paid form and transferable free of stamp duty. Proceeds were to be used in reducing overdrafts (which had reached about £5¼ million at the time) and to repay a £2 million loan from the Finance Corporation for Industry. The 5½ per cent debenture stock, redeemable 1979–84, stands at an all-in price of 99.

Dividend Prospects

First annual accounts of International Computers & Tabulators were to be made up to 30th September last; they would include a full year's trading of B.T.M. and nine months of Powers-Samas earnings. At the time of the merger there was a forecast of dividends totalling not less than 8 per cent on capital of £8·1 million. No firmer indication of dividend prospects accompanied the new issues, but the company's statement reported that trading results for the first part of the 1958–59 period showed an encouraging increase, and that profits of the new group were likely to exceed the previous annual profits of the two constituent companies. It was shown also that the latter would cover twice over a dividend of 8 per cent on the enlarged capital of £10 million. The quotation of the newly issued shares (of which Vickers took up their full quota) is approximately the same as for the old; they are transferable free of stamp duty but will not rank for the final dividend for the financial year just completed.

REPORTS and DIVIDENDS

George H. Scholes & Co., Ltd.—In his statement, which accompanies the report and accounts for the year ended 30th June last, Mr. F. J. Pearce (chairman and managing director) says that the works extension to which he referred last year has now been completed and is being fully utilised. Towards the end of the year they added new lines to their list of products, and whilst the sale of these did not materially affect last year's results there is every indication that they will be in good demand. They had again got off to a good start in the current year. In recognition of the loyalty and enthusiasm of the staff and employees, the company has made an award out of profits equal to a month's salary or four weeks' wages to each employee who has been in its service for twelve months, and half this amount to those with only six months' service.

The British Aluminium Co., Ltd., now a subsidiary of Tube Investments, Ltd., reports a trading profit for the seven months ended 31st July last of £2,004,418, as compared with £3,070,242 for the previous twelve months. Taxation absorbs £681,106, and the net balance is £689,388 (against £1,024,058), of which £617,845 is available to the company. It is proposed to pay a dividend of 5 per cent for the seven months' period (against 17½ per cent for the preceding twelve months).

The Perak River Hydro-Electric Power Co., Ltd., reports a net profit, subject to audit, for the year ended 31st July last of £146,161, as compared with £459,466 for the preceding year. The proposed ordinary dividend for the year is 5 per cent (against 10 per cent).

Allen West & Co., Ltd., are paying an interim dividend of 5 per cent (against 4⅛ per cent) on capital increased by a one-for-five scrip issue.

Mavor & Coulson, Ltd., have declared an interim dividend of 3¾ per cent (unchanged).

New Companies

Eastern Counties Electrics, Ltd.—Registered 15th September. Capital £2,000. To acquire the business of suppliers and repairers of electrical and domestic appliances now carried on by H. F. L. Waller, J. P. Beale and H. F. Waller at 3b, Norwich Road, Ipswich, and at 123, Hythe Hill, Colchester, as Eastern Electrics. Directors: H. F. L. Waller, J. P. Beale and H. F. Waller. Regd. office: 36, Norwich Road, Ipswich, Suffolk.

Modern Homes (Electricals), Ltd.—Registered 20th August. Capital £1,000. Electrical engineers and contractors, electricians, electronics, radio and television engineers, etc. Directors: R. Hunter, Mrs. Beryl Hunter, T. B. Atherton and Mrs. Margaret Atherton. Regd. office: 52, Penrose Avenue, Blackpool.

Higton & Sons (Ashbourne), Ltd.—Registered 19th August. Capital £2,000. Manufacturers, maintainers, repairers of and dealers in television tubes, electric motors and apparatus, etc. Directors: E. A. Higton and Mrs. Hilda Higton. Regd. office: Derby Road Works, Derby Road, Ashbourne, Derbyshire.

Woodgrange Electric, Ltd.—Registered 20th August. Capital £1,000. Electrical equipment specialists, manufacturers of and dealers in batteries, dynamos, etc. Directors: H. A. Sharpe, Gertrude S. Sharpe and G. F. Sharpe. Regd. office: 30, Woodgrange Road, Forest Gate, E.7.

Semiconductor Thermoelements, Ltd.—Registered 10th August. Capital £100. Manufacturers and licensees of and general research establishment for pure elements and chemical compounds, metals and alloys, semiconductors, insulators, etc. A. Gelbtuch is the first director. Secretary: M. W. Kerr. Regd. office: Room 4, 4th Floor, 93-97, Regent Street, W.1.

R. & B. Marland, Ltd.—Registered 27th August. Capital £1,000. Electrical engineers and contractors, etc. Directors: R. Marland (director Leenke, Ltd.) and Barbara Marland. Regd. office: 11, Peter Street, Manchester, 2.

Harold Harding, Ltd.—Registered 26th August. Capital £500. Manufacturers and repairers of cathode ray tubes, etc. Directors: H. Harding, S. G. Gray and R. W. Lucas. Regd. office: Bridge Works, Iver Lane, Cowley, Nr. Uxbridge.

Cathonia Sales, Ltd.—Registered 27th August. Capital £100. Buyers, sellers, distributors, dealers in all types of electrical apparatus, etc. Directors: W. D. Browne and Mrs. Maria F. Browne. Regd. office: 39, George Street, Manchester, 1.

Harrisons (Electrical & Refrigeration), Ltd.—Registered 28th August. Capital £2,500. To acquire the business of electrical refrigeration, radio and television engineers, heretofore carried on by F. Harrison at 142, High Street, Ryde, Isle of Wight. Directors: F. Harrison and Mrs. Barbara E. Harrison. Regd. office: 142, High Street, Ryde, Isle of Wight.

Special Appliance Co., Ltd.—Registered 28th August. Capital £100. Manufacturers of and dealers in dynamos, motor armatures, magnets, batteries, etc. Directors: K. W. Hole and Hilda J. D. Hole. Regd. office: 15, Willow Road, Poyle Estate, Colnbrook, Bucks.

Tyne-Tees Electrical Supplies, Ltd.—Registered 2nd September. Capital £1,000. Electrical engineers and consultants, electrical wiring and installation contractors, manufacturers of and dealers in electrical apparatus, etc. Directors: J. R. B. Blackburn, M. Wright, Mrs. Gladys M. Wright and W. W. Burns. Regd. office: 178, New Bridge Street, Newcastle-on-Tyne, 1.

Bevlau (Finchley), Ltd.—Registered 1st September. Capital £100. Manufacturers of and dealers in electrical goods and appliances, etc. Directors: S. Massil and S. Maudell. Regd. office: 38, Glenwood Drive, Gidea Park.

Tone Electrical & Engineering Co., Ltd.—Registered 1st September. Capital £6,000. Electricians, electrical and mechanical engineers, makers of electrical apparatus, etc. Directors: B. J. Freestone and B. H. Bratt. Regd. office: 27, Priory Bridge Road, Taunton.

J. & J. Electrics, Ltd.—Registered 2nd September. Capital £2,000. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, etc. Directors: J. W. Deane and Josephine H. Deane. Regd. office: 74, High Street, Godalming, Surrey.

G. Honnest-Redlich, Ltd.—Registered 1st September. Capital £2,000. Manufacturers of and dealers in engineering, electronic, electrical and radio and television apparatus, etc. Directors: G. M. H. Honnest-Redlich, C. J. Bransden, Mrs. Edna M. Honnest-Redlich and R. Clarke. Regd. office: 78, Victoria Road, Surbiton, Surrey.

Subelectrix, Ltd.—Registered 17th August. Capital £100. Electrical engineers and contractors, etc. Directors: R. Brown and R. M. Brown. Regd. office: 18, Dryden Court, Parkleys, Ham Common, Richmond, Surrey.

Scott Jones & Co., Ltd.—Registered 8th September. Capital £1,000. Electricians, etc. Directors: D. R. Jones and D. M. Scott. Regd. office: 18, High Street, Lydney.

Hagan Controls, Ltd.—Registered 9th September. Capital £100. Manufacturers, assemblers, suppliers, buyers, sellers, and importers of and dealers in automatic controls, instrumentation, data logging devices and systems, including mechanical, electrical or electronic sub-assemblies or components, etc. Directors: A. G. Clark, E. J. Earnshaw, M. W. Clark, D. Taylor, C. D. H. Webb, W. H. Hopwood, M. J. Botho and C. W. Sangstaken. Regd. office: 56, Vicarage Road, Ilford, Essex.

Dikes (Telectrical Services), Ltd.—Registered 9th September. Capital £1,000. Electrical engineers, etc. Directors: D. L. Dike and Mrs. June D. Dike. Regd. office: Cheap Street, Sherborne, Dorset.

Kintown Electrical Co., Ltd.—Registered 14th September. Capital £100. Electrical engineers and contractors, etc. Directors: H. W. Foster and F. Hardman. Regd. office: 1, Norgrove Street, S.W.12.

Metropolitan Electrics (London), Ltd.—Registered 11th September. Capital £5,000. Manufacturers of and dealers in electrical goods of all kinds, etc. R. M. Crown is the first director. Regd. office: 98, Belsize Lane, N.W.3.

Norman Arkley, Ltd.—Registered 10th September Capital £2,000. Manufacturers and distributors of, agents for, and wholesale and retail dealers in, electrical goods, radio and television receivers, etc. Directors: N. Arkley and Mary Arkley. Regd. office: 242, York Road, Leeds, 9.

Elpro Electrical Services, Ltd.—Registered 13th August. Capital £150. Directors: F. J. Hawker, June P. Y. Pitt and J. W. Pitt. Regd. office: 5, Victoria Road, New Barnet, Herts.

Watergate (Electrical) Co., Ltd.—Registered 3rd September. Capital £5,000. Manufacturers of and dealers in artificial lighting apparatus, etc. Directors: J. T. Budge, G. S. Budge and K. Smith. Regd. office: 36, Watergate Street, Chester.

Liquidation

Modern Electrical (Appliances), Ltd., dealers in electrical goods, 18, Wheathouse Road, Birkby, Huddersfield.—Winding up. Liquidator, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, 1, appointed 25th September. Particulars of claims to the liquidator by 31st October.

Bankruptcies

L. P. Harrison, 5, Medforth Road, Bridlington, Yorks., plumber and electrician, lately carrying on business at Trinity Mews, Bridlington. Trustee, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, 1, appointed 29th September.

S. G. Cottle, trading as Electro Products Co., at 218, High Road, Willesden, London, N.W.10. Receiving order made 29th September on debtor's own petition.

L. Filby and **G. D. Brown,** lately trading in co-partnership under the style of Filby & Brown, at 44, Park Street, Brighouse, Yorks. Public examination 1st December, at the County Court, Prescott Street, Halifax.

W. R. V. Salt, 232, Archway Road, Highgate, London, N.6, radio, television and electrical engineer. Trustee, Mr. A. A. Walter, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver, released 30th September.

G. Love and **F. E. Love,** trading as Love Bros., of Holt Road, North Elmham, Norfolk, cycle, radio and electrical engineers and newsagents. Second and final dividend of 5s 10½d in the £, payable at the Official Receiver's Office, Norfolk House, Exchange Street, Norwich.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 19th OCTOBER

Bath.—Royal York Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Electric Floor Warming."

Birmingham.—Grand Hotel. Birmingham Electric Club. "Instrumentation and Control," by R. J. Kingsnorth.

Crewe.—Mechanics' Institute, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Deltic Locomotive," by C. M. Cock.

Liverpool.—At the Royal Institution, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Subscriber Trunk Dialling," by D. A. Barron.

London.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. Chairman's address, "Remote Observation Using Closed Circuit Television," by L. A. Harris.

Manchester.—The University, 7 p.m. Institute of Physics, Manchester and District Branch. "Thermonuclear Research at Harwell," by M. G. Rusbridge.

Newcastle-on-Tyne.—Rutherford College of Technology, 6.15 p.m. I.E.E. North-Eastern Measurement and Electronics Group. Chairman's address, by C. C. Baxendale.

Norwich.—Assembly House, 7.30 p.m. I.E.E. East Anglian Sub-Centre. "A Review of Work Towards Nuclear Energy from Controlled Thermonuclear Reaction," by D. W. Fry.

Reading.—George Hotel, King Street, 7.15 p.m. I.E.E. Reading District Meeting. "The Provision of Adequate Installations in Small Houses and Flats," by C. A. Belcher.

TUESDAY, 20th OCTOBER

Bristol.—The University, 7.30 p.m. Society of Instrument Technology, Bristol Section. "Feedback," by R. S. Medlock.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. Chairman's address, by D. M. Thornton.

Farnborough.—Technical College, Boundary Road, 6 p.m. I.E.E. Southern Centre. "Space Research," by Dr. R. L. F. Boyd.

Leeds.—Conservative Club, South Parade, 6.30 p.m. I.E.E. North Midland Utilisation Group. "Discrimination Between H.R.C. Fuses," by E. Jacks.

London.—Manson House, 26, Portland Place, 6.30 p.m. A.S.E.E. Presidential address by Sir Josiah Eccles, and presentation of A.S.E.E. awards.

21, Bloomsbury Street, W.C.1, 6.30 p.m. Society of Relay Engineers. "Programme Circuits on Telephone Plant," by G. Stannard.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Supply Group. "The Selection of Insulation Levels and Tests for High-Voltage Transformers," by G. B. Harper.

Nottingham.—College of Arts and Crafts, 6.30 p.m. I.E.E. East Midland Centre. "The Recognition of Moving Vehicles by Electronic Means," by T. S. Pick and A. Readman.

Oxford.—Employment Exchange, 8 p.m. A.S.E.E. Oxford and Districts Branch. "The Construction and Purpose of Zeta," by P. B. Clarke.

Rugby.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. "World Wide Communications," by Dr. J. E. Flood.

South Farnborough.—Queen's Hotel, 7.30 p.m. A.S.E.E. Aldershot and Districts Branch. Film "Touch and Go," presented by C. F. Scholefield.

TUESDAY, 20th OCTOBER to THURSDAY, 22nd OCTOBER

London.—Royal Horticultural Society's New Hall, Westminster. Engineering Industries' Association Display.

WEDNESDAY, 21st OCTOBER

Birmingham.—College of Technology, Gosta Green, 6.15 p.m. I.E.E. South Midlands Education Discussion Circle. Discussion on "Schemes of Broader Education," by L. F. Turner, opened by P. W. Lansdown and Prof. D. G. Tucker.

Brighton.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Discrimination Between H.R.C. Fuses," by E. Jacks.

Cardiff.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. Chairman's address, "Distribution Substations—Past, Present and Future," by N. Care.

Glasgow.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 6 p.m. I.E.E. South-West Scotland Sub-Centre. Chairman's address, by J. E. Sayers.

Halifax.—Percival Whitley College of Further Education, Francis Street, 7 p.m. Institution of Production Engineers, East and West Ridings Region. "Productivity and Exports," by J. B. Scott.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. Chairman's address, "Where Next?" by Dr. J. R. Mortlock.

I.E.E. Graduate and Student Section. Visit to Johnson & Phillips, Ltd., Charlton, S.E.7 (2.30 p.m.).

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. "Present-Day Feed-Water Treatment for High-Pressure Boilers," by P. Hamer.

A.S.E.E. North West London Branch. Visit and lecture with demonstration at Research and Control Instruments, Kings Cross, N.1.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, Medical Electronics Group. "Electronic Instrumentation for Aviation Medicine," by P. V. Byford.

Manchester.—Queen's Hotel, 7.15 p.m. A.S.E.E. Manchester Branch. Film of the 1959 Electrical Engineers' Exhibition.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7 p.m. Society of Instrument Technology, Newcastle Section. "Automatic Control of Space Heating and Air Conditioning Plant," by D. H. Powell.

Nottingham.—E.M.E.B. Showroom Theatre, Carrington Street, 7.30 p.m. A.S.E.E. Nottingham Branch. "Electrical Safety in the Home," by S. J. Emerson.

Peterborough.—Angel Hotel, 7.30 p.m. I.E.E. East Midland Centre. "Subscriber Trunk Dialling," by D. A. Barron.

Rochester.—King's Head Hotel, High Street, 7 p.m. Institution of Plant Engineers, Kent Branch. "Metal Spraying and Ceramic Coating," by J. A. Sheppard.

Sheffield.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. Chairman's address, "Permanent Magnets and the Electrical Engineer," by F. G. Tyack.

Wembley.—A.S.E.E. South West London Branch. Visit to Associated Rediffusion Studios.

Wolverhampton.—Chamber of Commerce, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Off-Peak Electric Heating in Horticulture," by L. Arkinstall.

WEDNESDAY, 21st OCTOBER to SATURDAY, 31st OCTOBER

London.—Earls Court. International Motor Exhibition.

THURSDAY, 22nd OCTOBER

Birmingham.—Engineering Centre, Stephenson Place, 7 p.m. Institute of Marine Engineers, West Midlands Section. "Electrical Marine Equipment," by S. A. G. Emms.

Bristol.—Royal Hotel, College Green. Combustion Engineering Association, Western Region. 11 a.m. "The Technical Application of Fuel Oil in Industry," by D. J. Heslop; 2.15 p.m. Film on "Cyclone Firing."

Chelmsford.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Electrically Powered Furnaces for Melting of Metals," by W. L. Harrison.

Croydon.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Semiconductor Power Rectifiers," by P. S. Clayton.

Dublin.—Physical Laboratory, Trinity College, 6 p.m. I.E.E. Irish Branch. Chairman's address, by T. P. Hogan.

Glasgow.—39, Elmbank Crescent. British Institution of Radio Engineers, Scottish Section. "True Motion Radar," by J. H. Beattie.

Hull.—Y.E.B. Offices, Ferensway, 6.30 p.m. I.E.E. North Midland Centre. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Haselgrave.

London.—Royal Commonwealth Society, Northumberland Avenue, Strand, W.C.2, 7 p.m. Institution of Production Engineers, South Eastern Region. "Computers as Applied to Production Control," by B. L. J. Hart.

Southampton.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "Studio Technique," by V. G. Hawkeswood.

Warrington.—I.E.E. Mersey and North Wales Centre. Chairman's address, "The Development of the Telephone System in Great Britain," by T. A. P. Colledge.

FRIDAY, 23rd OCTOBER

Edinburgh.—The University, Drummond Street, 7 p.m. British Institution of Radio Engineers, Scottish Section. "True Motion Radar," by J. H. Beattie.

Leeds.—The University, 7.30 p.m. A.S.E.E. Leeds Branch. "The Prospects of Power from Controlled Thermonuclear Energy," by Dr. A. E. Robson.

London.—Café Royal, Regent Street, W.1. A.S.E.E. Golfing Society. Dinner-dance.

Newcastle-upon-Tyne.—Grey Hall, King's College, 6.30 p.m. I.E.E. North Eastern and Graduate and Student Section. "Vacuum as an Insulator," by R. Hawley.

Swansea.—Guildhall and Patti Pavilion, 11.30 a.m. and 2.30 p.m. Joint meeting of the I.E.S. and A.P.L.E. in South Wales.

SATURDAY, 24th OCTOBER

London.—A.S.E.E. South East London Branch, 10 a.m. Visit to Dartford Paper Mills.

Electronics Filmstrips

The Mullard Educational Service has announced the introduction of a new series of filmstrips designed to assist the teaching of electronic engineering in technical colleges, Services training establishments, industrial apprenticeship courses, and so on. The first of the series—"Thermionic Oscillators"—is available now from the distributors, Unicorn Head Visual Aids, Ltd., 42, Westminster Palace Gardens, London, S.W.1, price 25s a copy including comprehensive teaching notes. The second, which deals with non-sinusoidal oscillators, is in preparation, and will be followed by others covering the subjects of modulation and transmission.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Brighton.—Corporation. 14th November. One 1,000 kV impulse generator for new College of Technology. (See this issue.)

Burma.—Electricity Supply Board, Rangoon. 10th November. P.v.c. cables. (E.S.B. 23944/59. Ten/42512.)*

Ceylon.—Ceylon Transport Board, Colombo. 11th November. Batteries for passenger transport vehicles. (E.S.B. 23617/59. Ten/42499.)*

Coventry.—Corporation. Aerodrome electrical equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 2nd November. Instrument transformers. (E.S.B. 23766/59/I.C.A. Ten/42474.)*

India.—Madras State Electricity Board. 29th October. Air break switches with load interruptor device. (E.S.B. 23625/59. Ten/42423.)*

National Coal Development Corporation, Ranchi. 12th November. Electric cables and accessories. (E.S.B. 23221/59. Ten/42442.)* 16th November. Eight 5 kW/10 kW generating sets. (E.S.B. 23313/59. Ten/42374.)* 27th November. Pole mounting gang operated air break switch with accessories. (E.S.B. 23220/59. Ten/42441.)*

Kanpur Electricity Supply Administration. 12th November. 2,400 d.c. meters and 3,100 a.c. meters. (E.S.B. 23503/59. Ten/42448.)*

Rajasthan State Electricity Board, Jaipur. 18th December. Insulators and hardware for transmission lines. (E.S.B. 23693/59. Ten/42458.)*

Iraq.—Directorate General of Water & Electricity, Baghdad. 31st October. Diesel generating sets for new power station at Barzan. (E.S.B. 23568/59. Ten/42408.)*

Directorate of Contracts and Purchases, Ministry of Defence, Baghdad. 28th October. Electrical equipment, including insulators, cable, pumping set, galvanised spindles, etc. (E.S.B. 23667/59. Ten/42498.)*

Jordan.—Transjordan Electric Power Co., Amman. 25th October. Medium voltage indoor distribution equipment. (E.S.B. 23529/59/I.C.A. Ten/42478.)*

New Zealand.—Wellington Electricity Department. 29th October. Switchboards. (E.S.B. 23646/59. Ten/42421.)*

Auckland Electric Power Board. 6th November. L.v. cable. (E.S.B. 23560/59. Ten/42397.)* H.v. cable. (E.S.B. 23561/59. Ten/42396.)*

New Zealand Electricity Department, Wellington. 15th December. Three 6,667 kVA transformer units. (E.S.B. 23641/59. Ten/42439.)*

Pakistan.—Posts and Telegraphs Directorate General, Karachi. 2nd November. Telephone cable. (E.S.B. 23817/59. Ten/42493.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 23rd October. Copper covered steel wire. (E.S.B. 23512/59. Ten/42495.)*

South Africa.—Union Tender Board, Pretoria. 4th November. Six 500 kVA transformers. (E.S.B. 23502/59. Ten/42385.)*

Tender Board, Pietermaritzburg. 28th October. X-ray equipment. (E.S.B. 24033/59. Ten/42537.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Sunderland.—Corporation. 6th November. Electrical installation in Grindon Village School. (See this issue.)

Thailand.—Thai Technical and Economic Committee, Bangkok. 30th October. Electrical apparatus, including power capacitors, disconnecting switches, cutouts, fuses, lightning arrestors, insulators, oil circuit reclosers, etc. (E.S.B. 23716/59/I.C.A. Ten/42482.)*

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Barnsley.—New police headquarters (£250,000); borough engineer, Town Hall. Hospital for chronic sick; E. F. Wilson, architect, Fulwood House, Old Fulwood Road, Sheffield.

Brighton.—Bungalows (28), Linkway site, Woodingdean; D. J. Howe, borough engineer, King's Road.

Chelmsford.—Flats (20), Tower Avenue; Modern City Properties, Ltd., Glasshouse Fields, Cable Street, E.1.

Showrooms and offices, Moulsham Street; S. C. Hunt & Partners, architects, 78, New London Road.

Chesterfield.—First instalment of Chesterfield School (£55,156); A. Mason (Contractors), Ltd., Mansfield, Notts.

Chorley.—Houses (123), Burgh Lane estate; borough engineer, Town Hall, Chorley, Lancs.

Day special school, Harrington Road, and school clinic and child welfare centre, Collison Avenue; county architect, County Offices, Fishergate Hill, Preston.

Darlington.—Infants' school, Skerne Park; borough architect, Central Buildings.

Deudraeth.—Houses (100); L. Ellis, clerk, Council Offices, Penrhyndeudraeth, Merionethshire.

Dewsbury. — Technical-secondary school (£230,000); Wm. Airey & Sons, Ltd., Eldon House, Leeds.

Eastbourne.—Flats (20), Bourne Street and Seaside Road; Y. J. Lovell & Son, Ltd., 10, Gildredge Road.

Gateshead.—Grammar school for boys; G. F. Winters, borough engineer.

Gosport.—Houses (65), Rowner; borough engineer, The Hall, Haslar Road, Gosport, Hants.

Harrogate.—Technical high school at rear of Claro Road housing estate (£238,891); H. Bennett, county architect, Westfield Road, Wakefield.

Hartlepool.—Houses (95) for the North-Eastern Housing Association, Ltd., Newcastle-on-Tyne; Thomas Armstrong, Ltd., contractors, Cockermouth, Cumberland.

Inkersall.—Houses (42), Inkersall Green estate; U.D.C. surveyor, Staveley, Derbyshire.

Ipswich.—Offices, Sedan Street; Walter Lawrence & Son, Ltd., 31, Sun Street, London, E.C.2.

Isle of Ely.—First instalment of permanent buildings for Witchford County Secondary School; county architect, County Hall, March, Cambs.

Litherland.—Houses, bungalows and flats (192); G. D. Walford & Partners, 20, Castle Street, Liverpool, 2.

Longford.—Factory; Alliance Box Co., Ltd., Orford Lane, Warrington.

Merthyr Tydfil.—Dwellings (299), Gurnos area; borough architect.

Norfolk.—Extensions to Thorpe Grammar School (£144,328); F. L. Ralphs, chief education officer, Stracey Road, Norwich.

Northampton.—Radiotherapy department and cobalt unit for General Hospital; Oxford Regional Hospital Board, 43, Banbury Road, Oxford.

Northumberland.—Primary school at Kielder (£26,000); county architect, County Hall, Newcastle-on-Tyne.

Infants' school, Forest Hall; Cawood Wharton & Co., Ltd., contractors, Harrogate.

Oxford.—Houses (206), Templar Road site; E. G. Chandler, city architect, Town Hall.

Redhill.—Three-storey block of shops and maisonnettes, Cromwell Road; H. Davies, town clerk, Town Hall, Reigate.

Saltburn (Yorks.).—Conversion of Marske Hall into offices for U.D.C. (£16,000); R. Stroughair, surveyor.

Scarborough.—Extensions to Scarborough College, Filey Road; R. W. Clayton, architect, Wintringham, Malton.

Sheffield.—Flats and maisonnettes (208), Brookhill, Netherthorpe; city architect.

Office block, Oakes Green; English Steel Corporation, Ltd., River Don Works.

Skipton.—Outpatients' and casualty wing at Skipton General Hospital; architect to the Board, Park Parade, Harrogate.

Southampton.—Houses (63), Thornhill, and block of four-storey flats, Cuckmere Lane, Millbrook; borough engineer, Civic Centre.

Stamford.—Dwellings (44), King's Road; F. J. Lenton & Partners, architects, 16, Broad Street.

Stockton-on-Tees.—Housing developments at Ragworth Nurseries; Ideal Builders, Ltd., Hartburn Avenue.

Proposed grammar school; Middleton & Partner, architects, 111, Albert Road, Middlesbrough.

Stretford.—Multi-storey flats, Cornbrook Road area; city surveyor.

Strood.—Additional 100 houses on the Hoo site; surveyor, Council Offices, Frindsbury Hill, Rochester, Kent.

Tynemouth.—Sports car factory, North Shields; R. S. Robson, 3, Longston Avenue, Cullercoats, Whitley Bay.

Alterations to Western Junior and Infants' Schools (£40,000); D. M. O'Herlihy, borough engineer, 16, Northumberland Square, North Shields.

Houses on 166 acres of land for Murton Farm Estates, Ltd.; William Stockdale, architect, 73, Howard Street, North Shields.

Wallsend.—Junior school at Willington Quay; G. Denton, borough education officer.

Wembley.—Flats (38), Harrow Road; Fitzroy Square Properties, Ltd., 71, Wimpole Street, London, W.1.

West Hartlepool.—Houses (1,298), Rift House; A. G. Sinclair, borough architect.

Wigan.—Public baths, Library Street (£400,000); Sir Percy Thomas, architect to Council, Cathedral Road, Cardiff.

Worcester.—Three-storey block of shops with maisonnettes over and two three-storey blocks of flas at Warndon estate; city engineer, 22, Bridge Street.

Worthing.—Shops (12) and flats (30), Muir House site; Kent & Surrey Estates, Ltd., 5, Liverpool Gardens.

Wrexham.—Houses (over 500), shops, community centre, church, etc., Acton Park estate; J. M. Davies, borough engineer, 31, Chester Street.

Yaxley.—Houses (52), Broadway estate; Ruddle & Wilkinson, architects, Long Causeway Chambers, Peterborough.

York.—Offices, Holgate; Cawood Wharton & Co., Ltd., Westlands, Harrogate.